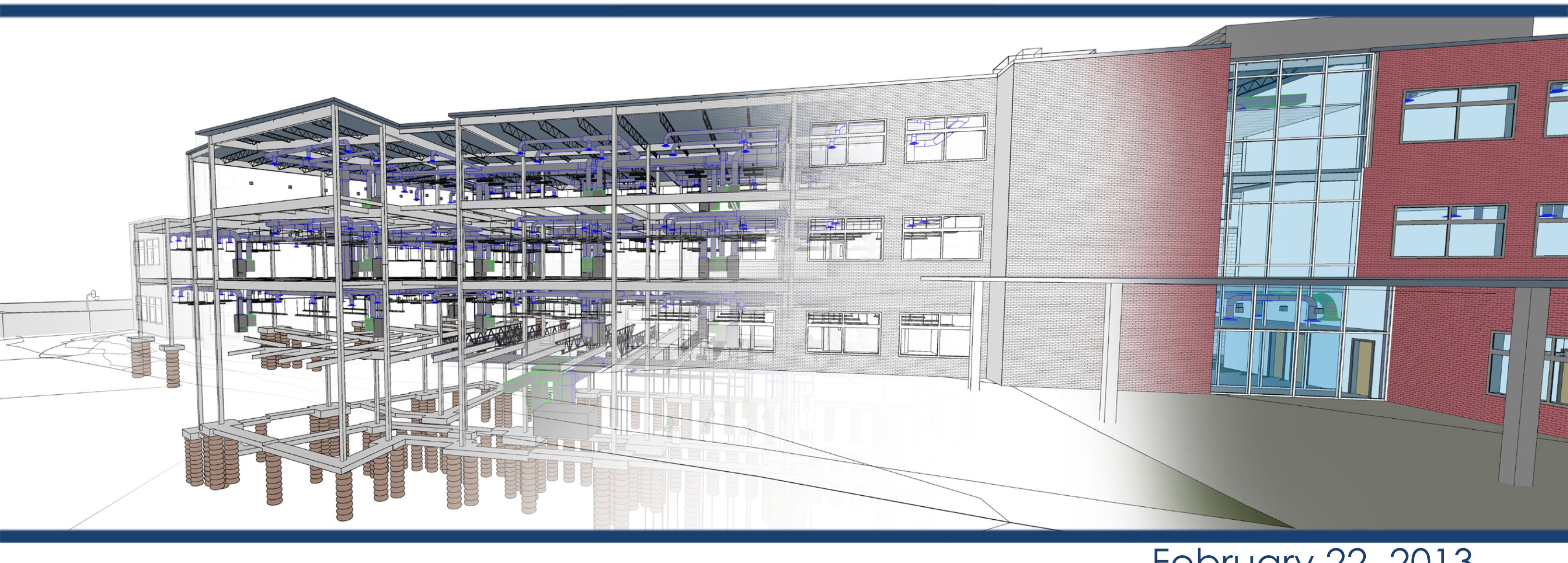
Reading
Elementary
School

AEI Team 10-2013

Construction



February 22, 2013

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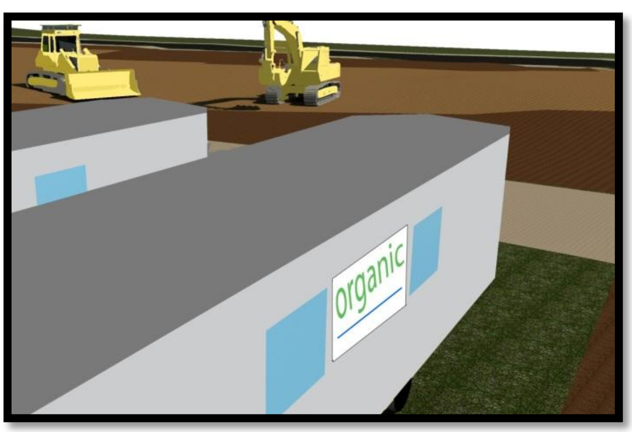


SECTION 1: SUMMARY NARRATIVE

EXECUTIVE SUMMARY

The Construction Management report for AEI Team 10-2013, "Organic," begins by laying out the goals of the Charles Pankow Foundation Annual Architectural Engineering Student Design Competition. After establishing these goals, the body of the report explains how the team's design meets them through practices such as through reduced operation costs and providing an interactive learning environment for students at the Reading Elementary School (RES). Highlights of some of Organic's unique design elements include an idea for an indoor, centrally located pool to maximize usable site space for a safer parking lot location and a community playground. The project will utilize a design-build organizational structure with a guaranteed maximum price contract type, as it is the most innovative building solution and will be most cost-effective to the community of Reading by alleviating change orders during construction. To keep subcontractors on schedule during the construction process, milestone dates have been established that must be met. More details will be added to the schedule for specific construction processes when their date of execution draws closer, most notably application of SIPS for repetitive items such as façade and classroom construction. Also aiding in a successful construction sequence are detailed site utilization plans for each phase of the construction process and highly integrated 3D drawings to reduce clashes in the field. Organic believes that it is important to create a smooth turnover for building occupants, so a transition plan has been implemented to train staff, and feedback has been received from end-users to optimize design features. Also important to the design team was an extensive review of applicable building codes and standards to ensure that design met expectations of code officials. This is beneficial because it will cut down on design flaws that could slow construction, will speed up the permit process, and will ensure safety and satisfaction for the students and faculty of the RES.

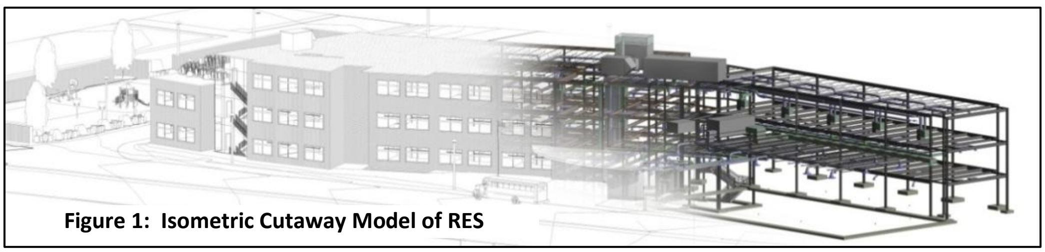


Figure 1: Isometric Cutaway Model of RES

PROJECT GOALS & INTRODUCTION

CONSTRUCTION GOALS

1. Design a cost-effective facility to help the entire community grow
2. Plan for & adapt to issues of safety & quality throughout construction
3. Provide a safe & efficient environment for end users

The goals of the Charles Pankow Foundation Annual Architectural Engineering Student Design Competition are clearly defined as the design and construction management of the engineered aspects of a high performance building. Integration and collaboration of the engineered systems is to be used **to improve the quality, efficiency, value and performance of the overall building, while pursuing new innovative solutions to realize these goals**. The design intent for RES was to create a learning space that would effective as an educational facility, as well as a valuable asset to the Reading community. To attain these goals, the team set out specific construction objectives. For construction managers, it is often their responsibility to ensure that the project goals are met while considering the best interests of the owners and end users. By keeping the team's goals as high priorities, Organic will be able to not only meet, but exceed the goals of the Charles Pankow Foundation. ***Like a living organism,*** Organic's team has the ability to ***grow & adapt*** to the many challenges that arise over time.

PRELIMINARY PROJECT PLANNING

Table 1: BimEx Plan

PRIORITY	GOAL DESCRIPTION	BIM USES
HIGH	COLLABORATIVE DESIGN	WORKSHARING, CENTRAL MODELS
HIGH	4D MODEL	3DS MAX, NAVISWORKS
HIGH	MINIMIZE CLASHES	NAVISWORKS
HIGH	PROJECT DOCUMENTATION	REVIT
HIGH	PRESENTATION GRAPHICS	3DS MAX, NAVISWORKS
HIGH	QUANTITY TAKE-OFFS	REVIT
HIGH	COST ESTIMATING	REVIT
HIGH	ENERGY MODELING	REVIT
HIGH	FULLY INTEGRATED MODEL	GREEN BUILDING STUDIO, REVIT
MED	LIGHTING CALCS	ELUMTOOLS
LOW	RENDERINGS	3DS MAC, REVIT

BIM Execution

Creating an early BIM Execution Plan is essential in having a successful project. For this reason it was one of the first things the team did. It is how the goals were determined, as well as what the building process would be. The team set out to have effective communication by utilizing texting, emailing, but most importantly, face-to-face communication at weekly meetings. Implementing BIM technology was also determined as can be seen in Table 1.

Having this table helped to organize the team's direction and highlight important computer applications. Each facet of the list played a part in achieving our team goals and creating a successful, integrated project, because these programs allowed us to work efficiently. They also allowed easy access for information because all files were saved to our centrally located folder that could be accessed by all parties from any computer on the network.

Environment Investigation

As a part of the first investigations into the project, the team wanted to learn more about the environment of the location of the future building. This is because a number of environmental factors can affect a team's process in the design and construction of a building. Reading is in southeastern Pennsylvania, and the city's website ranks it as the fifth most populated city in the state, with 88,082 residents. It has an average temperature range between 22 degrees Fahrenheit and 86 degrees Fahrenheit, and receives 45.32 inches of rain annually. According to the United States Geological Survey, it has some of the highest earthquake potential in the state, and the site has a high potential for sinkholes (Appendix A).

The city ranks among the highest in the state for both city violent crimes and city property crimes (11 per 1,000 residents and 52 per 1,000 residents respectively). Also, it is a relatively poor area, with 58% of students receiving free or reduced lunch.

DESIGN

As stated in our introduction, our design process was driven by the goals that were agreed upon as a team. After doing our preliminary investigation, the team decided how our goals would overcome various site issues and shape both our designs and methods.

Because crime is a problem in Reading, the goal of ***end user safety*** was extremely important. As a result, our design will include many features to keep students and faculty out of harm's way, such as secure doors and site features, as can be seen in Figure 3. It is our hope that our security design will not only be effective, but will also work in a passive manner that avoids too many overbearing features that may make people uncomfortable.

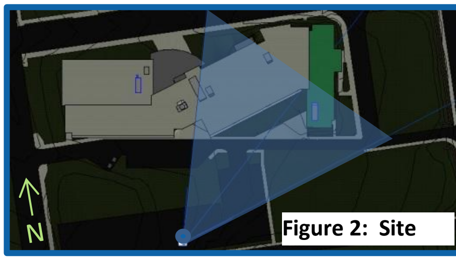


Figure 2: Site

Southern View showing (A) Secure, Monitored Doors (B) Well-Lit Exterior (C) Safe Bus Pick-Up Drop-Off Zone (D) Architectural Playground Security Wall (E) Flush Exterior Façade Design Change

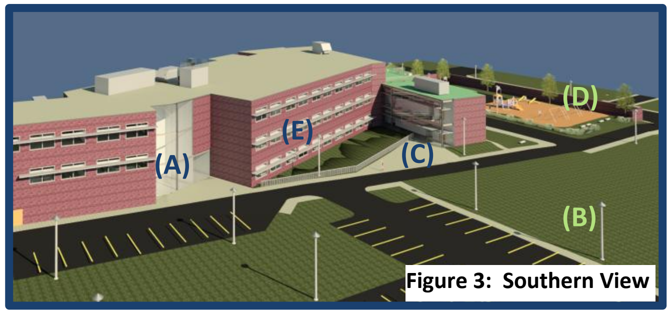


Figure 3: Southern View

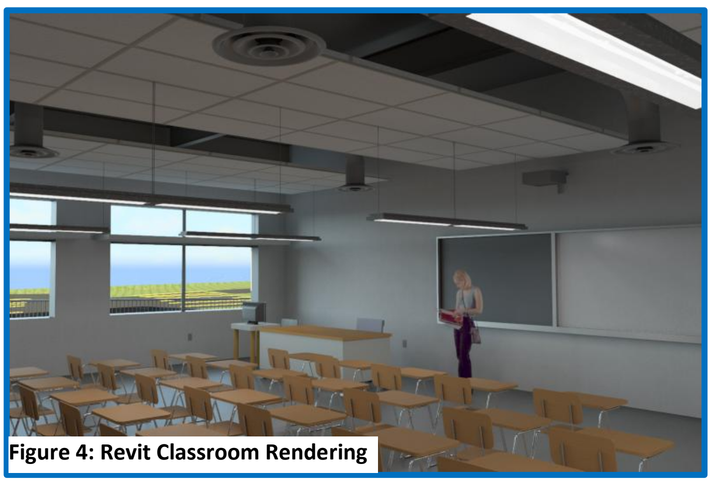


Figure 4: Revit Classroom Rendering

Our goal of creating a cost effective, energy efficient, and high quality design helped us to come up with our overall theme for school: ***using the building as a learning tool***. Since Reading is a poor city, cost effective design is mandatory because additional costs will be hard to justify to a school board. In addition, ***energy efficiency*** will help save operation costs, and by exposing our energy efficient systems to students within the building, teachers can inform students about how the systems work. Learning about energy efficient buildings from an early age will hopefully help students understand the benefits of green construction and energy conservation to one day practice it themselves and save money in their communities. This idea focuses on making the building not just a ***place*** for students to be, but rather an ***environment*** to learn in.

The team decided to make a few changes to the plans that was originally presented. The team created a flush façade on the southern exterior wall to improve constructability and make room for heat pump closets and group instruction areas. These group instruction areas are meant to be an interactive learning environment where teachers can bring students to learn about how the building is operating through various energy output monitors. Also, rather than have computers in all of the classrooms like on the drawings that were presented, it was decided that having a limited number of mobile laptops for students to share throughout classrooms, group instruction areas, or elsewhere in the school would be more cost-effective and flexible. In the third floor group instruction area, there will be access to the green roof that can be used for LEED purposes, which will be discussed later. This green roof will not only act as a part of sustainable design, but will also act as a unique learning environment.

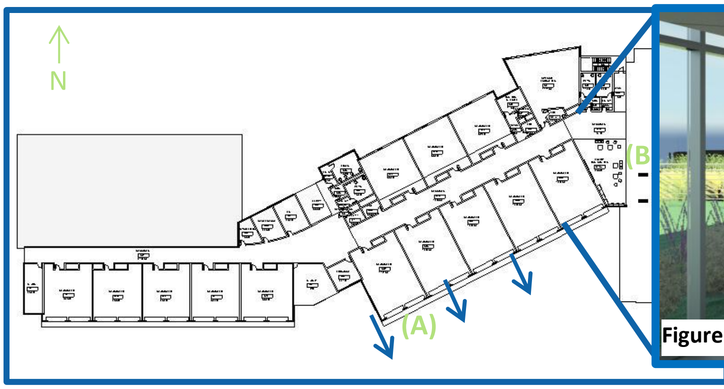
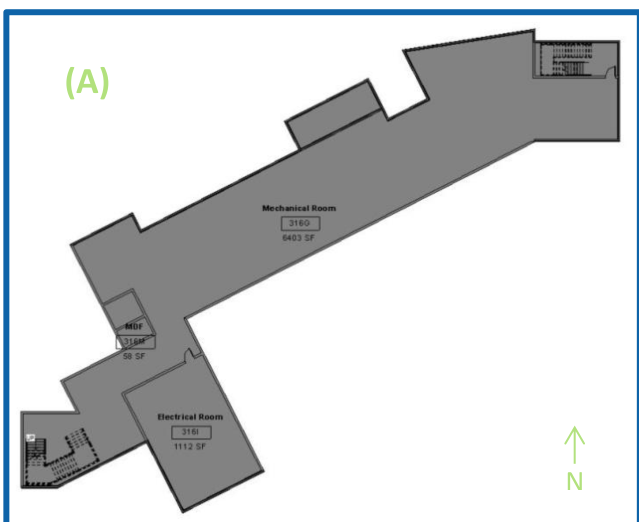


Figure 5: Large Group Instruction Area/Green Roof

Extension of First and Third Floors creates a flush façade (A) and room for interactive, flexible Group Instruction Areas (B)

The changing of the southern façade wall also helped in making it possible to design a proposal for an add-alternate swimming pool addition in the basement of the school. The team decided that a swimming pool addition should go here for a number of reasons. First of all, it helps in turning the school into a truly ***centralized community center*** with various community spaces such as multipurpose room, swimming pool, and community room all within the same building in close proximity. Second, our design simply extends the footprint of the basement and does not create any additional exterior entrances to the school. ***Limiting the number of entrances*** for a possible intruder will help enhance the safety of those inside. Lastly, if the owner gives us the go-ahead to construct the pool where proposed, it will be in the optimum location for minimizing land usage. This is important in decreasing impermeable cover and achieving LEED credits that would otherwise be difficult to acquire had a separate on-site structure been designed to house the pool.



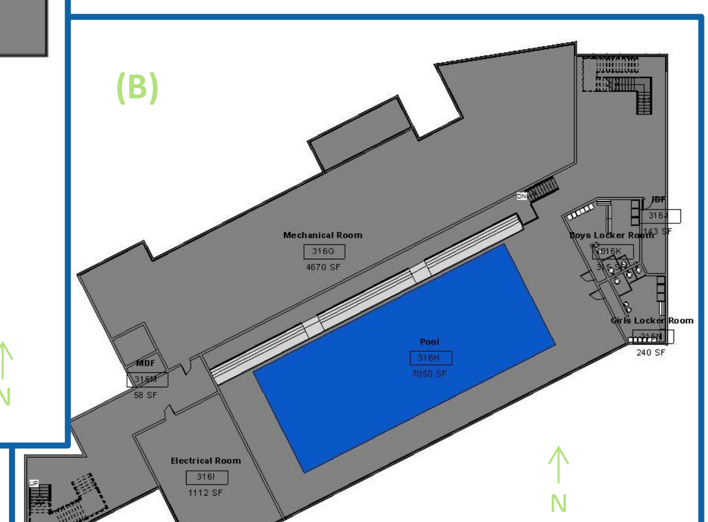


Figure 6: Swimming Pool Plan

Revit Models of the Original Basement Plan presented to us (A), our Proposed Swimming Pool Addition (B), and basement location relative to First Floor(C)

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In addition to making a ***greener site***, maximizing the finished land space will allow us to create a community playground for the school district. Our team plan on putting this at the eastern entrance of the school, moving the entrance from Park Street out to the East while putting all parking lot space for the school to the South. The existing school will be demolished and parking spaces will be placed there in addition to the ones that are there already. This idea utilizes the existing parking spaces for the new school as well as maximizes safety. Safety is enhanced by re-locating the parking for two reasons: First, it forces visitors to enter the school in the center near the administration area, and second, it minimizes the walking distance to the centrally located community spaces for after school functions when it could possibly be dark and dangerous outside.

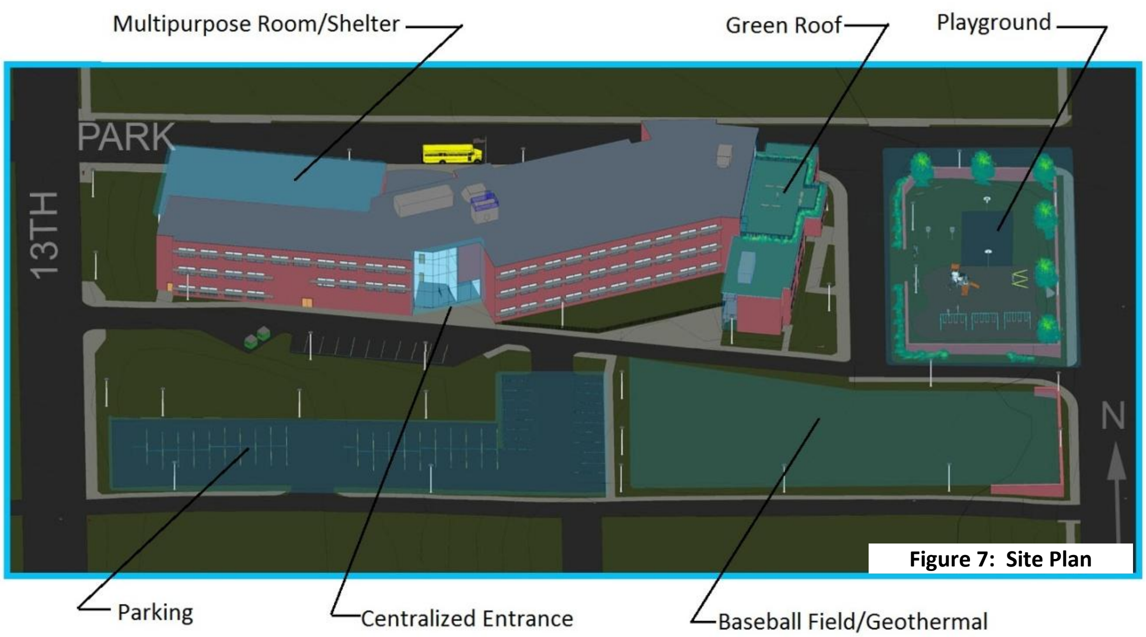

Figure 7: Site Plan

More detailed design aspects include laterally braced structure to deal with potential seismic activity, a multi-hazard resistant shelter facility in the multipurpose room, geothermal heat pumps, and extensive use of daylighting. All of these features help us achieve our design goals and make the Reading Elementary School a safe place that can benefit the community.

SYSTEMS OVERVIEW

Table 2: Systems Overview

Structural	Geopier foundation system; composite steel framing with hybrid masonry walls; multi-hazard resistant multipurpose shelter
Mechanical	Hybrid system utilizing ground coupled heat pumps to offset traditional heating/cooling
Lighting	Daylight as a primary light souce combined with electric light to enhance overall aesthetics and energy efficiency while improving learning environment
Electrical	Organized power distribution to monitor building usage and provide a safe and secure learning environment
Construction	Design build delivery method with a guaranteed maximum price; 16-month construction duration
Architectural	Community pool included at basement level of proposed school; green roof outdoor learning environment; security-assessed playground on east portion of project site; precast-panel façade system combined with exterior glazing for optimum daylighting efficiency

COST ANALYSIS

Table 3: Project Budget

READING ELEMENTARY SCHOOL CONSTRUCTION BUDGET				
SF: 82,433		YEAR: 2013		
CATEGORY	DESCRIPTION	COST	COST/SF	% OF ORIG. CONTRACT
A. Substructure	A10 Foundations	$200,526.52	$2.43	1.49%
	A20 Basement Const	$792,473.48	$9.61	5.87%
B. Shell	B10 Superstructure	$2,098,250.00	$25.45	15.54%
	B20 Exterior Enclosure	$1,307,574.00	$15.86	9.68%
	B30 Roofing	$564,278.00	$6.85	4.18%
C. Interiors	C10 Interior Const	$1,436,344.00	$17.42	10.64%
	C20 Stairs	$287,268.80	$3.48	2.13%
	C30 Interior Finishes	$1,149,075.20	$13.94	8.51%
D. Services	D10 Conveying	$76,947.00	$0.93	0.57%
	D20 Plumbing	$705,347.50	$8.56	5.22%
	D30 HVAC	$2,039,095.50	$24.74	15.10%
	D40 Fire Protection	$294,963.50	$3.58	2.18%
	D50 Electrical	$1,577,413.50	$19.14	11.68%
E. Equipment & Furnishings	E10 Equipment	$259,696.13	$3.15	1.92%
	E20 Furnishings	$86,565.38	$1.05	0.64%
F. Special Construction & Demolition	F10 Special Const	$106,000.00	$1.29	0.79%
	F20 Selective Building Demolition	$520,985.78	$6.32	3.86%
Subtotal		$13,502,804.29	$163.80	100.00%
Time Adj. Factor		$303,813.10	$3.69	2.25%
Add-Alternate (Pool)		$1,597,569.30	$19.38	11.83%
General Conditions		$1,340,743.00	$16.26	9.93%
Taxes		$810,168.26	$9.83	6.00%
Fee		$675,140.21	$8.19	5.00%
Bonds & Insurance		$337,570.11	$4.10	2.50%
TOTAL		$18,567,808.27	$225.25	

Discovering that Reading is a low-income community further enhanced the belief that the design and construction strategy must be ***cost-effective***. To determine a competitive square foot cost, the design team compiled data from various resources and found that an average elementary school cost was around $237/SF (See Appendix B). In addition to overall building costs, D4 Estimating Software and R.S. Means Costworks provided us with costs for each division within the estimate. This data was used as a budget for the design, and we performed more detailed estimates for items when things became more finalized, such as for the pool, the playground, and selective demolition.

It should be known that, in order keep costs low, the construction team will take part in incentives to save money without sacrificing quality. This will be achieved through salvaging of materials during demolition and by employing programs such as a community "Build Day" for the playground. *Whole Building Design Guide*'s website says that organizing a successful "Build Day," in which community members erect the playground equipment, can cut costs by 30%. Not only will this save money, but it will also act as an excellent way to help bring the community of Reading together.

It is also worth noting that the pool design is to be proposed as an add-alternate to the contract sum. The construction team must know by May 1, 2013 whether the pool area will be pursued, as this is when excavation will be underway. Even if the pool itself will be too costly to build at the present date, it is recommended that the structure of the space be constructed anyway and used for some other purpose temporarily (perhaps as storage or a community fitness center) until funds become available, as it will be impossible to construct the current pool design once the building is completed. If the space is not constructed now, a future pool will have to be housed in an addition to the school footprint, and this will ultimately cost more money than the current design (See Appendix C).

DELIVERY METHOD

The construction delivery method is of upmost importance when deciding how to structure the project and how risk will be shared between the owner, contractors, and designers. Owner involvement, project schedule, cost, and risk are some of the most important aspects that influence project delivery selection. In the analysis of project delivery method for the Reading Elementary school, it was decided that a Design/Build delivery method with a Guaranteed Maximum Price would be most beneficial to the owner.

Design-Build delivery method with a Guaranteed Maximum price contract was found to be the most beneficial delivery method for this project. Organic recognizes that Pennsylvania's Department of

General Services currently adheres to The Separations Act but that it is currently under review by the state. Organic's team of designers, engineers, and construction managers believes that this project would benefit from a Design/Build project and has approached it as such. The school board desires a project team of construction managers partnered with designer engineers to create the most ***innovative building solution***. By utilizing a Design/Build delivery, the construction managers are able to insert feedback on design decisions early on in the project and work with the designers to create the best possible solutions. By using a Guaranteed Maximum Price, Organic would be able to create a budget based on construction and deliver that construction for the maximum price or less. Savings below this budget would be split 50/50 between the owner and Organic.

The risk assumption of this delivery method allows the Design/Build team to minimize the owner's risk by consulting with the owner throughout the design and construction process. As the Design Builders, our team will create a budget based on the designed school and create work packages to be competitively bid out to subcontractors.

Using this delivery method allows us to further strive to meet our main goals of a cost-effective, energy efficient, high quality design as well as allows us to develop efficient planning and scheduling. By integrating the construction with design, our team is able to meet these goals throughout the entire building process.

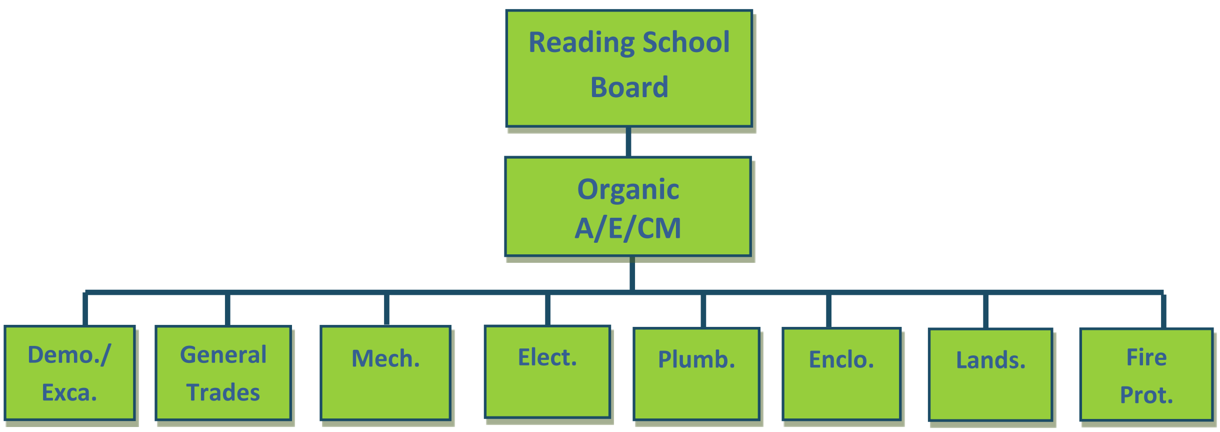

Figure 8: Organizational Chart

SCHEDULE

Milestones

Another major construction management task was determining the best schedule to meet or exceed the project goals. Our team began by determining a start and finish date based on months of school operation and placed important milestones in between. Some important milestones that must be achieved to maintain schedule include:

- **Excavation – April 8, 2013** – We chose this as our beginning excavation date for a number of reasons. First, we can expect the ground to be thawed in this location by April which will make excavation much easier. Also, we plan on following excavation with our foundation work, which will entail possible drilling and placing concrete. By using this date, we can ensure that we will not be forced place concrete in freezing conditions or drill foundations in a few feet of snow.
- **Pool Go/No-Go Date – May 1, 2013** – The construction team must know by this date whether or not the proposed pool add-alternate will be pursued, as excavation will be

wrapping up shortly afterward. In addition to changing the foundation depth in the area, mechanical and electrical alterations will need to be made and need to be accounted for early.

- **Structural Steel Topping Out – July 1, 2013** – Structural steel topping out was scheduled based on what work activities had to follow as well as our watertight schedule goal. We wanted to allow enough time for masonry construction as well as our precast panel erection to still meet the goal established.
- **Watertight - September 30, 2013** – We selected this as the milestone date for when we expect the building structure to be watertight because we would be able to save a lot of money with temporary heat if we can have the building enclosed as well as store materials in the building to protect against harsh weather that falls after October.
- **Substantial Completion – June 2, 2014** – It is important that we leave enough time to turn the building over and provide adequate training to facility managers who will need to learn how to work the various heating, cooling, lighting, and security systems of the building.
- **School Year Begins – August 25, 2014**

Detailed Schedule

Knowing that the milestone deadlines had to be met helped in determining durations for specific schedule activities in between. This helped us create our more detailed construction schedule which has a start date of March 8, 2013 and a final occupancy date July 2, 2014 (See Appendix F).

Phases

Once the schedule was finalized, the various, "broad" phases that would bring the team from start to completion were determined:

1) Startup	**5) Exterior Finish**
2) Demolition	**6) Interior Finish**
3) Excavation	**7) Sitework**
4) Superstructure	**8) Turnover**

To further enhance the design and construction goals, our team determined unique issues of safety and quality for each phase of the construction. Next, specific plans to address these issues at each phase of the construction process were devised. Site plans for each phase were created to communicate the layout of the site and how space will be utilized during those times. The plans and write-ups can be seen below, and larger site plans can be found in Drawings 201-207.

1. **STARTUP – Safety Concerns:** Busy traffic to the North, school children to the South, & close sidewalk proximity. **Quality Control:** Isolating construction site to alleviate disturbance to the city. **Overview:** The startup phase is when things get mobilized and most of our general conditions items will be put in place, such as trailers, waste receptacles, and our ***temporary site fencing*** to keep people, especially students off the site. Our plan is to make ***a gravel road*** that will allow vehicles to pass through the site from 13th street to 14th street. We did not want to put an entrance on Park Street because the program said that it was a very busy street, and we didn't want our vehicles to create traffic problems. Also we wanted to put gravel

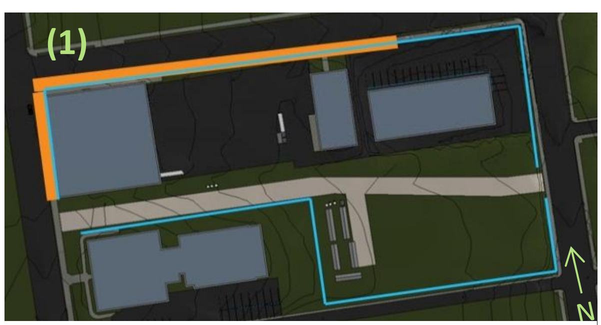

Figure 9: Startup Phase 3/8/13

down to help alleviate the amount of dirt that gets trailed off of the site and onto the city streets. In the northwest portion of the site, sidewalks are in very close proximity to construction, so we plan on utilizing ***protected walkways*.**

2. **DEMOLITION – Safety Concerns:** Falling debris, asbestos, lead paint, and children attending existing school. **Quality Control**: Efficient recycling and waste removal plan. **Overview:** We plan on having two crews working on demolition. One crew will be on the two smaller buildings to the east and one crew will work on the larger building to the west. According to the program, the two smaller buildings are slab on grade, so they should be easier to get rid of. We realize that during demolition there will be a large opportunity to recycle materials, so we will have large recycling containers for each crew to recycle things like concrete, bricks, wood, etc. Workers handling materials in demolition will be required to wear protective equipment such as breathing masks to protect their lungs as well as gloves and other safety gear to protect their skin in case contaminants are found in the building materials. Since school will be in session during this phase and vehicles will be passing through the site, we plan to have heightened security and constant vigilance at the

Figure 10: Demolition Phase 3/18/13

3. **EXCAVATION – Safety Concerns:** Open excavation pits, sinkholes, & contaminated soil. **Quality Control**: Sedimentation and erosion control. **Overview:** During excavation we will take measures to remediate the problem of the contaminated soil. Periodic testing of site soil will occur and any contaminated soil found will be removed and incinerated. Dump trucks will be on call to make deliveries of fill in the event that many sinkholes are encountered and crews will be told to perform tool-box talks on excavation safety, specifically with sinkholes. When deep pits are encountered, holes will be flagged off around the edges so that people do not fall into them. Crews will work from west to east (downhill), and behind excavation crews, equipment will be brought in to construct geopiers for the foundation work. We will establish a ***material storage and laydown area*** and place tarps there to catch any soil that may run downhill during a rainstorm. We will also store any ***topsoil*** there that we plan on using later. Some of the recycling containers will remain on site to recycle whatever we can.

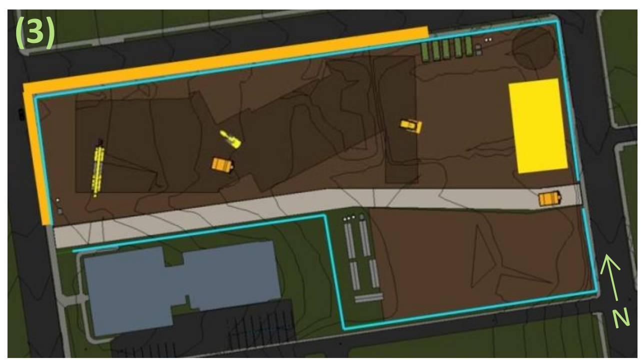

Figure 11: Excavation Phase 4/15/13

4. **SUPERSTRUCTURE – Safety Concerns:** Crane swing & steel workers. **Quality Control:** Providing different areas for different crews to work in without congestion & keeping the site clean. **Overview:** We plan to erect the steel superstructure from floor to roof in three separate phases working west to east. The first phase will be the western most portions and will consist mostly of the multipurpose room. One reason that we would like to have this done early is that we hope to use the large covered space as a protected laydown and storage area for materials. Protecting materials from rain is one way of protecting against mold and achieving IEQ LEED credits. Once everything there has been erected, the crane will back out and construct the middle piece of the building, which will be pretty much where the finished pool basement will be. Lastly we will construct the eastern portion of the building which is only two stories and has a green roof. While superstructure is being built, work will begin on the well field in the south of the site for geothermal heat pumps.

Figure 12: Superstructure Erection

5. **EXTERIOR FINISH – Safety Concerns:** Site congestion and school children. **Quality Control:** Getting the building water-tight and protected before winter. **Overview:** Because the site is very narrow in spots, we feel that the best way to erect the precast Slenderwall façade will be with two smaller cranes working together. Smaller cranes will be more flexible in where they can go and will most likely be better off in dealing with the SIPS schedule that we plan on utilizing. For the multipurpose room, the wall assembly is different and scaffolding will have to be erected to finish the façade there. Also at this time, the bulk of MEP work will be happening inside the school, so demand for increased storage area may go up. One of the reasons the geothermal field was started early was so that some, if not most of it could be used for extra material storage area during this busy phase of construction.

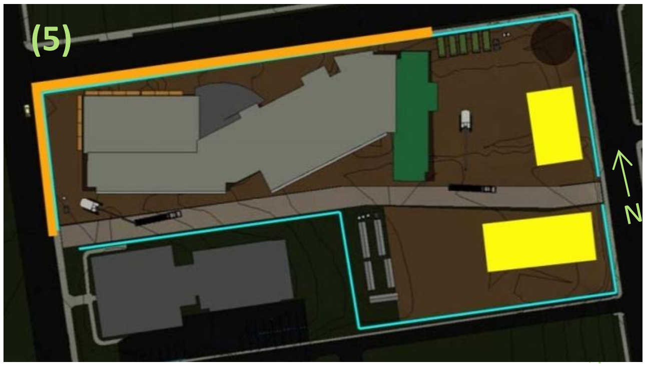

Figure 13: Exterior Finishing 7/1/13

6. **INTERIOR FINISH – Safety Concerns:** School children & inclement winter weather. **Quality Control**: Keeping interior material finishes protected from the elements. **Overview:** During interior finish, site congestion will be dialed down and materials will be moved closer to the school for easier access. Minor site cleanup will begin in preparation for site work on the playground in the east of the site and for the baseball field at the south of the site.

Figure 14: Interior Finishing 9/23/13

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7. **SITEWORK – Safety Concerns:** Falling debris. **Quality Control**: Performing site construction without disturbing the relatively completed school and saving recyclable materials. **Overview:** The biggest part of our sitework plan is to move the fences and walkways to the existing elementary school to begin demolition. Sitework surrounding the new school will start while school is in session and existing school demolition will begin once the school year has ended. This building will be demolished to create the parking lot for the new school. Parking lots were moved from the original plans to utilize some of the existing parking there and make them more centrally located to the school. It is important that construction of the playground to the east and demolition in the south will not damage any part of the nearly completed school. Crews will be told to recycle as many demolished materials as possible to gain LEED points.

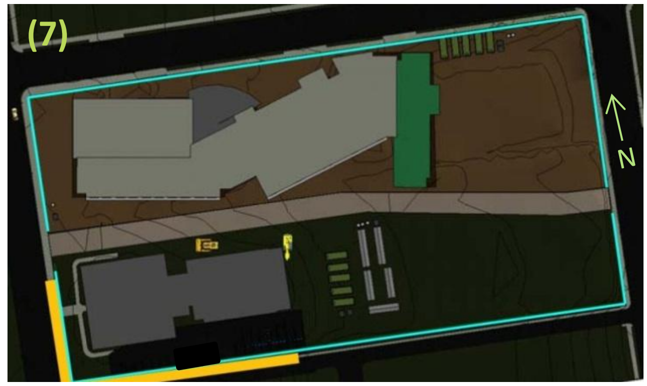


Figure 15: Sitework 4/14/14

8. **TURNOVER- Safety Concerns:** None. **Quality Control:** Testing and balancing of systems and training teachers and facility managers to properly use building systems. **Overview:** During turnover, teachers and facility mangers will be brought to the school for training to understand the building and its systems. End construction of the building has been planned to allow more than a sufficient amount of time for teachers to get their classrooms set up and learn about the layout of the school before the new school year will start there.

Figure 16: Turnover 7/2/14

Procurement Schedule

To cut down on the amount of time that materials are on site waiting to be installed, delivery dates for some of the major items, such as structural steel and façade panels were decided upon. The plan to get these things on site in a timely manner led to the development of a detailed procurement schedule. This schedule takes owner and architect approval into account as well as lead times for products, such as mill orders for steel, and provides due dates for when they must be ordered by to maintain a successful schedule. A detailed procurement schedule can be found in Appendix F.

Short Interval Production Scheduling (SIPS)

Our team chose a precast panel façade system called Slenderwall for our building that will allow for quick installation of the building enclosure and reduce the amount of material on site at a given time. Some characteristics of this system are:

- Installation – 19 minutes per panel
- Panel Size – 8-feet by 30-feet (various sizes available)
- Panel Weight – average approximately 7000 lbs. per panel dependent on size
- Safety – reduce scaffolding, repetition
- Aesthetics – variety of finishes

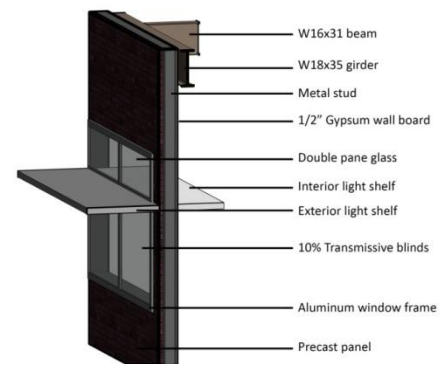


Figure 17: Slenderwall Diagram

Another benefit of this system is that it includes interior metal studs and insulation on the backs of the façade panels. Also, the repetitive nature of installation has allowed us to apply Short Interval Production Scheduling (SIPS) to further refine our schedule and enhance construction safety through design.

Because the school is comprised of many similar classrooms, our team plans on having contractors apply SIPS to enhance safety and efficiency in those areas of construction. Doing so will require effective communication and progress tracking throughout construction, which we plan on doing with 4D Scheduling and weekly update meetings.

TRANSITION PLAN

Some of our most important goals regarding the design and construction of the Reading Elementary school are a Cost-Effective, Energy Efficient, and High Quality Design along with ***End User Safety and Satisfaction***. With these goals in mind, our construction management team came up with the idea to create a Transition Plan that would improve the transition from the existing elementary school to the new school. This Transition Plan will aid in moving into the new facility in a few key ways:

1. Teach facility managers to use and service new energy efficient equipment
2. Let teachers see and have input into the overall design of typical classrooms
3. Allow teachers to see potential safety concerns based on classroom designs

Getting teacher feedback is a very important aspect of this Transition Plan. It is somewhat of two-part process. In the beginning of the design process, pictures of our ideas along with the following questions were submitted to teachers in order gain insight into what teachers expect from a classroom:

1. What things do you like about your current classroom design?
2. What things would you change about your current classroom?
3. What types of teaching tools do you use most often? (PowerPoint, Chalkboard)
4. What types of technologies would you like in your classroom? (Laptops, TV's)

The feedback received helped us gain the perspective of the most important group in the entire building lifecycle: the end-user. Figure 15 presents the major findings of our feedback report. As an example, our team plans to implement these findings by utilizing maximum natural daylighting with light shelves as well as flat track electrical wiring under carpet to allow for multiple outlet configurations and flexibility. Executing BIM helps people visualize ideas and communicate them effectively to others.

1. Natural Lighting
2. Easily Accessible Electrical Outlets
3. Built in Bookshelves
4. Noise Separation
5. Wireless Capabilities

Figure 18: Classroom Image/Teacher Input

Another part of the Transition Plan deals with the facility management staff. As indicated in our milestone schedule, time has been allotted after substantial completion to train the facility staff that will be responsible for the general upkeep of the systems within the school. This will allow us to ensure that for the life of the building, the mechanical and electrical systems installed are properly maintained and therefor performing as designed. Organic also intends to use virtual mock-ups of the mechanical and electrical equipment rooms to review access and serviceability, all with the aim of creating ***end-user satisfaction***.

LEED POINTS

The Reading School District has said that they would like the school to achieve LEED status, and together with the other disciplines on this project, the team believes that with the right planning, a LEED Silver Rating can be achieved.

Some credits are easy to get and some will be automatically attained based on our site location. Others, such as recycling materials, are based on percentages, but these numbers are attainable, especially during the demolition phase of construction. LEED stresses to maximize open space and vegetation and limit impermeable cover. This was one of the reasons our team didn't want to house the pool in a separate building on site, and is also the reason why installing a green roof on the eastern part of the building is beneficial. Other specific LEED approaches relatable to Construction Management can be found in Appendix D.

Table 4: LEED Summary

RES LEED SUMMARY	LEED CREDITS
Sustainable Sites (SS)	18
Water Efficiency (WE)	6
Energy & Atmosphere (EA)	15
Materials & Resources (MR)	4
Indoor Environmental Quality (IEQ)	13
Innovation in Design (ID)	2
Regional Priority (RP)	0
Total LEED Credits	**58**
LEED 2009 for Schools New Construction and Major Renovations certifications are awarded according to the following scale:	
Certified	40-49
Silver	50-59
Gold	60-79
Platinum	80+

One of the most important LEED credits to us is the "School as a teaching Tool" credit. This is not only an opportunity for LEED points, but is also part of the driving force behind our design. As stated earlier, our design team plans on making the MEP and structural systems exposed architectural features of the school that will act as a unique teaching tool that instructors can use to explain how buildings work and teach children from a young age about energy conservation. Exposed items will be color coordinated to indicate different components of the building such as hot and cold water pipes, return ducts, and other things so that they are easily distinguishable. For additional LEED information, see Appendix D.

CODE ANAYLIS

One of the most important things to consider when designing a building is the established building codes for the area. An innovative, cost-effective, and exciting idea is nothing without meeting code requirements, because without meeting code, a building will be potentially unsafe and remain what it is: simply an idea.

In the case of our proposed design and construction of the Reading Elementary School, our team followed the codes of *International Building Code 2009*, which according to "reedconstructiondata.com" is the building/dwelling code for Reading, Pennsylvania. Also studied in our code analysis was "pacode.com," which according to their website is an "official publication of the Commonwealth of Pennsylvania that contains regulations and other documents." Specifically referenced is Chapter 349, which is titled *School Building Standards* and contains, among other things, a list of codes that should be followed in PA school construction.

Our design for the Reading Elementary School will be Type IB Construction and have two different zones for use. The majority of the building will be Group E, Educational, but if the swimming pool addition is pursued, it will have to be Group A-4 and be separated from the mechanical area in the basement. The multipurpose room on the first floor does not count as an assembly space because it is attached to an educational facility. With these designations, square footage is unlimited and height limitations will not be an issue.

In terms of fire protection, a sprinkler system is definitely needed for the basement. For the other floors, the possibility of creating firewalls to alleviate the need for sprinkler was explored, but, in the end using a sprinkler system rather using spray fireproofing on the exposed structural elements throughout our school design was best.

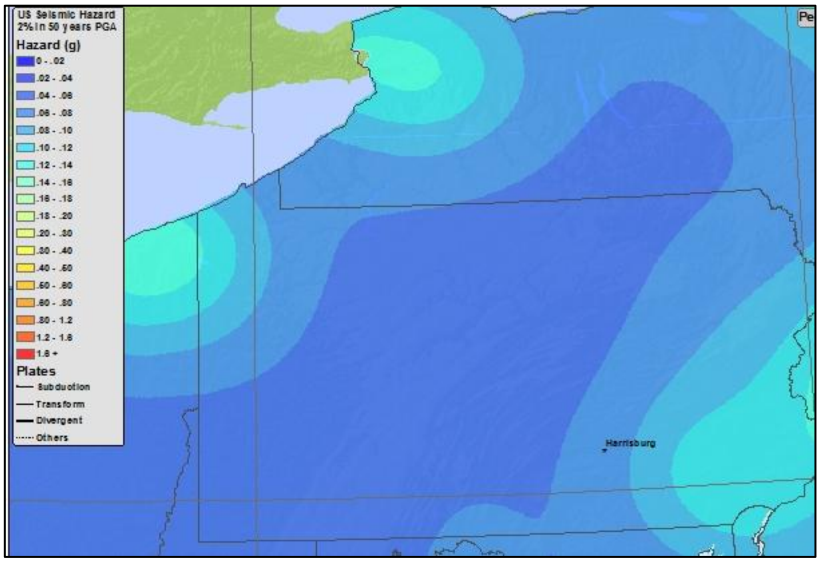
A lot of time was spent ensuring that the design for the possible swimming pool addition was up to code. Two different exit routes were sized and a seating capacity of 120 spectators, a pool capacity of 54 people, and a pool deck capacity of 180 people were determined. ADA requirements were also taken into consideration. For this reason, the elevator from the first floor of the school allows access to the top bleacher level, and a wheelchair lift at the end of our seating area will allow those in wheelchairs to reach the pool deck. For egress purposes, an area of refuge for those in wheel chairs will be provided at both stairwells. For additional code information, see Appendix E.

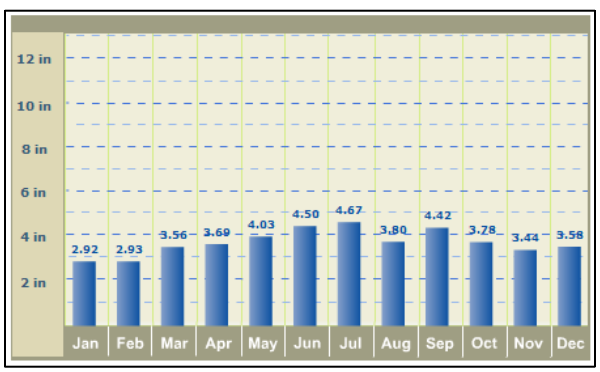
Figure 19: Northeast View

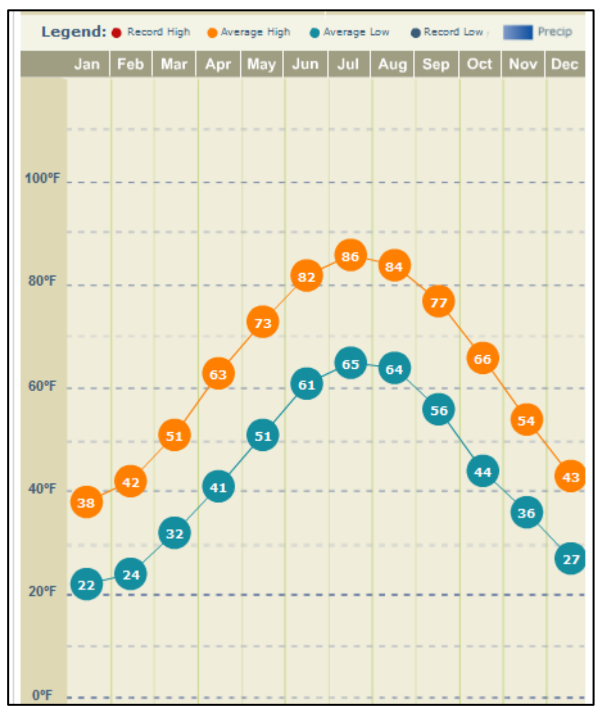
SECTION 2: SUPPORTING DOCUMENTATION

Appendix A: WEATHER

All weather data was taken from weather.com and seismic information is courtesy of the U.S. Geological Survey's website







Appendix B: COST ESTIMATES

D4 Cost Estimating Software and R.S. Means CostWorks was used to create the following estimates:

	Square Foot Cost Estimate Report
Estimate Name:	Reading Elementary
Building Type:	School, Jr High, 2-3 Story with Face Brick with Concrete Block Back-up / Steel Frame
Location:	READING, PA
Story Count:	3
Story Height (L.F.):	15
Floor Area (S.F.):	82433
Labor Type:	Union
Basement Included:	Yes
Data Release:	Year 2012
Cost Per Square Foot:	$208.07
Building Cost:	$17,152,500

Costs are derived from a building model with basic components.

Scope differences and market conditions can cause costs to vary significantly.

	% of Total	Cost Per S.F.	Cost
A Substructure	7.70%	$12.05	$993,000
B Shell	41.60%	$64.76	$5,338,000
C Interiors	18.40%	$28.57	$2,355,500
D Services	30.30%	$47.06	$3,879,500
E Equipment & Furnishings	2.00%	$3.14	$258,500
SubTotal	100%	$155.57	$12,824,500
Contractor Fees (General Conditions,Overhead,Profit)	25.00%	$38.89	$3,206,000
Architectural Fees	7.00%	$13.61	$1,122,000
User Fees	0.00%	$0.00	$0
Total Building Cost		$208.07	$17,152,500

Code	Division Name	%	Sq. Cost	Projected
03	Concrete	18.96	39.96	3,294,213
	Concrete	16.96	35.75	2,946,778
	Precast Plank	2.00	4.21	347,435
05	Metals	7.36	15.52	1,279,211
	Steel Supply	5.20	10.97	903,958
	Steel Erection	2.16	4.55	375,253
06	Wood & Plastics	5.54	11.69	963,360
	Carpentry	4.63	9.76	804,829
	Architectural Woodwork	0.91	1.92	158,531
07	Thermal & Moisture Protection	4.50	9.50	782,718
	Joint Sealers	0.15	0.32	26,744
	Roofing & Flashing	4.35	9.17	755,974
08	Doors & Windows	6.73	14.19	1,169,963
	Coiling & Overhead Doors	0.11	0.22	18,466
	Doors Frames Hardware	1.50	3.16	260,760
	Aluminum Windows	4.30	9.06	746,886
	Aluminum Entrances	0.83	1.75	143,850
09	Finishes	15.32	32.29	2,661,426
	Acoustical Treatment	1.25	2.64	217,657
	Tile & Stone	2.49	5.24	432,331
	Painting	0.87	1.84	151,845
	Wood Flooring	0.35	0.73	60,226
	Drywall Plaster	9.05	19.07	1,572,175
	Carpet Resinous Flooring	1.31	2.76	227,192
10	Specialties	1.16	2.45	201,758
	Lockers	0.51	1.07	88,399
	Folding Partitions	0.31	0.66	54,095
	Display Boards	0.34	0.72	59,264
11	Equipment	2.13	4.49	370,130
	Athletic	0.20	0.41	33,997
	Food Service	1.93	4.08	336,133
12	Furnishings	1.18	2.48	204,438
	Casework	1.18	2.48	204,438
14	Conveying Systems	0.42	0.88	72,465
	Elevators	0.42	0.88	72,465
15	Mechanical	25.49	53.73	4,428,735
	Plumbing HVAC	11.03	23.24	1,916,137
	Fire Protection	1.07	2.26	186,682
	Ventilation/Controls	13.39	28.22	2,325,916
16	Electrical	11.21	23.63	1,947,657
	Electrical	11.21	23.63	1,947,657
	Total Building Costs	100.00	210.79	17,376,074

READING ELEMENTARY SCHOOL CONSTRUCTION BUDGET				
SF: 82,433		YEAR: 2013		
CATEGORY	DESCRIPTION	COST	COST/SF	% OF ORIG. CONTRACT
A. Substructure	A10 Foundations	$200,526.52	$2.43	1.49%
	A20 Basement Const	$792,473.48	$9.61	5.87%
B. Shell	B10 Superstructure	$2,098,250.00	$25.45	15.54%
	B20 Exterior Enclosure	$1,307,574.00	$15.86	9.68%
	B30 Roofing	$564,278.00	$6.85	4.18%
C. Interiors	C10 Interior Const	$1,436,344.00	$17.42	10.64%
	C20 Stairs	$287,268.80	$3.48	2.13%
	C30 Interior Finishes	$1,149,075.20	$13.94	8.51%
D. Services	D10 Conveying	$76,947.00	$0.93	0.57%
	D20 Plumbing	$705,347.50	$8.56	5.22%
	D30 HVAC	$2,039,095.50	$24.74	15.10%
	D40 Fire Protection	$294,963.50	$3.58	2.18%
	D50 Electrical	$1,577,413.50	$19.14	11.68%
E. Equipment & Furnishings	E10 Equipment	$259,696.13	$3.15	1.92%
	E20 Furnishings	$86,565.38	$1.05	0.64%
F. Special Construction & Demolition	F10 Special Const	$106,000.00	$1.29	0.79%
	F20 Selective Building Demolition	$520,985.78	$6.32	3.86%
Subtotal		$13,502,804.29	$163.80	100.00%
Time Adj. Factor		$303,813.10	$3.69	2.25%
Add-Alternate (Pool)		$1,597,569.30	$19.38	11.83%
General Conditions		$1,340,743.00	$16.26	9.93%
Taxes		$810,168.26	$9.83	6.00%
Fee		$675,140.21	$8.19	5.00%
Bonds & Insurance		$337,570.11	$4.10	2.50%
TOTAL		$18,567,808.27	$225.25	

AEI Team 10-2013

The following was taken from School Planning & Management Magazine, which is a publication of Peter Li Education Group:

REGION 2 NJ, NY, PA

How Much Is Being Spent? ($000s)

	New Schools	Additions	Renovations	Total
Completions in 2010	$513,348	$392,482	$588,861	$1,494,691
Completions in 2011	$551,985	$293,335	$449,218	$1,294,538
Starting in 2011	$517,620	$318,016	$478,487	$1,314,123
Total Activity	**$1,582,953**	**$1,003,833**	**$1,516,566**	**$4,103,352**
% of Total	38.6%	24.5%	37.0%	

Where Is the Money Going?

	Total ($000s)	Elementary	Middle	High	District
Completions in 2010	$1,494,691	34.3%	18.9%	45.8%	1.0%
Completions in 2011	$1,294,538	50.5%	7.8%	39.6%	2.1%
Starting in 2011	$1,314,123	43.4%	10.5%	44.7%	1.4%
Total Activity	$4,103,352	42.3%	12.7%	43.5%	1.5%

New Schools Only

	Cost/ Sq. Ft.	Cost/ Student	Sq. Ft./ Student	Median Cost ($000s)	Median # Students	Median Size (Sq. Ft.)
Elementary	$309.52	$38,571	138.5	$26,000,000	673	90,000
Middle/JHS	$250.00	$40,000	173.3	$24,000,000	600	104,000
High School	$262.01	$40,000	174.0	$81,710,636	1,400	333,810

5 PROFILE OF NEW SCHOOLS CURRENTLY UNDERWAY

National Medians	$/Sq. Ft.	$/Per Student	Sq. Ft./ Per Student	No. of Students	Building Size (Sq. Ft.)	Building Cost ($000's)
Elementary Schools	$190.48	$25,500	125.0	600	75,000	$14,800
Middle School	$215.14	$29,959	149.0	936	140,000	$30,000
High Schools	$188.68	$30,833	156.3	1,600	260,000	$54,900
Low Quartile	**$/Sq. Ft.**	**$/Per Student**	**Sq. Ft./ Per Student**	**No. of Students**	**Building Size (Sq. Ft.)**	**Building Cost ($000's)**
Elementary Schools	$156.72	$18,962	106.7	500	64,000	$11,600
Middle School	$172.41	$23,774	124.0	750	101,000	$21,000
High Schools	$164.46	$25,769	125.0	1,200	150,000	$32,000
High Quartile	**$/Sq. Ft.**	**$/Per Student**	**Sq. Ft./ Per Student**	**No. of Students**	**Building Size (Sq. Ft.)**	**Building Cost ($000's)**
Elementary Schools	$268.24	$36,667	140.0	800	95,000	$22,755
Middle School	$248.65	$36,667	162.2	1,200	170,000	$41,000
High Schools	$252.50	$42,037	187.5	2,064	342,000	$75,534

COMPARABLE BUILDING COST ESTIMATES

Data	Year	Location	S.F.	Price	Per S.F.	Location Factor	Time Factor	Adjusted S.F. Cost
D4 Estimate	2013	Reading, PA	82,433	$17,376,074	$210.79	1.00	1.00	$210.79
R.S. Means Costworks	2012	Reading, PA	82,433	$17,152,500	$208.08	1.00	1.02	$212.24
Clearview Elementary School	2002	Hanover, PA (Near York)	43,638	$6,887,822	$157.84	1.03	1.56	$253.62
School Planning & Management	2011	National	75,000	$14,800,000	$197.33	0.99	1.06	$207.08
School Planning & Management	2011	PA,NJ,NY	90,000	$26,000,000	$288.89	0.99	1.06	$303.16
							AVG	$237.38

Appendix C: DETAILED ESTIMATES

Staffing Plan					
Title	Involvement During Construction		Cost/Unit	Unit	Total Cost
	Percent of Time	Weeks			
Project Manager	100%	64	3350	wks	$214,400.00
Superintendent	100%	64	3100	wks	$198,400.00
Project Engineer	100%	64	2825	wks	$180,800.00
Safety Manager	80%	51	2825	wks	$144,640.00
Quality Control Manager	80%	51	2825	wks	$144,640.00
Field Engineer	90%	58	2050	wks	$118,080.00
Office Engineer	75%	48	2050	wks	$98,400.00
Secretary	100%	64	775	wks	$49,600.00
					$1,148,960.00

Total General Conditions	
Total General Conditions	
Staffing	$1,148,960.00
Site Costs	$191,783.00
Total General Conditions	$1,340,743.00

General Site Conditions				
Temporary Fencing				
Item	Cost/Unit	Unit	Quantity	Total Cost
6ft Fence	$7.00	LF	1790	$12,530.00
Trash Services				
Item	Cost/Unit	Unit	Quantity	Total Cost
Recycling Dumpsters	$986.70	Each	10	$9,867.00
	$10.00	Day	400	$4,000.00
Trash Dumpsters	$500.00	Each	8	$4,000.00
	$5.00	Day	400	$2,000.00
				$19,867.00
Porta Potty				
Item	Cost/Unit	Unit	Quantity	Total Cost
Porta Potty	$100	Month	96	$9,600.00
Delivery	$50	Month	96	$4,800.00
				$14,400.00
Temporary Fire Protection				
Item	Cost/Unit	Unit	Quantity	Total Cost
Fire Extinguishers	$70.00	Each	15	$1,050.00
Job Trailer				
Item	Cost/Unit	Unit	Quantity	Total Cost
Large Trailer	$375.00	Month	32	$12,000.00
Small Trailer	$209.00	Month	48	$10,032.00
Delivery				$800.00
				$22,832.00
Temporary Utilities				
Item	Cost/Unit	Unit	Quantity	Total Cost
Job Lighting	$12.00	CSF Flr	830	$9,960.00
Temporary Power	$60.00	CSF Flr	830	$49,800.00
Temporary Water	$62.00	Month	16	$992.00
				$60,752.00
Office Equipment				
Item	Cost/Unit	Unit	Quantity	Total Cost
Supplies	$265.00	Month	16	$4,240.00
HVAC & Lighting	$167.00	Month	16	$2,672.00
Telephone & Data	$100.00	Month	16	$1,600.00
				$8,512.00
Site Security				
Item	Cost/Unit	Unit	Quantity	Total Cost
Security Officer	$27.00	hr	1920	$51,840.00
		TOTAL SITE COSTS		$191,783.00

Foundation Estimate				
Excavation and Replacement				
Quantity	Units	Cost/unit	Total Cost	Notes
30000	CY	$3.09	$92,700.00	Excavate
37500	LCY	$2.12	$79,500.00	Backfill
30000	BCY	$16.00		
37500	LCY	$3.82	$143,250.00	Compact
109.61	BCY	$19.97	$2,188.91	Excavate for footings-1 CY Bucket
109.61	CY	$73.92	$8,102.37	3000 PSI concrete - Material
109.61	CY	$22.56	$2,472.80	3000 PSI concrete - Labor
2.581	Ton	$2,283.00	$5,892.42	#5 bar reinforcing - Material and Labor
			$334,106.51	
Micropiles				
Quantity	Units	Cost/unit	Total Cost	Notes
1	EA	$15,000.00	$15,000.00	Equipment Mobilization
7312.5	V.L.F	$27.06	$197,876.25	Driven Steel Piles - Concrete filled
843.75	CY	$30.09	$25,388.44	Concrete Pile Caps-Labor
843.75	CY	$73.92	$62,370.00	Concrete Pile Caps-Material (3000 psi)
2.581	Ton	$2,283.00	$5,892.42	Concrete Pile Caps-Steel Reinforcing
			$306,527.11	
GeoPiers				
Quantity	Units	Cost/unit	Total Cost	Description
2	EA	$15,000.00	$30,000.00	Equipment Mobilization
830	BCY	$1.79	$1,485.70	Loading Soil to Trucks
1037	LCY`	$14.40	$14,932.80	
2470	LF	$55.21	$136,368.70	Price of all except hauling excavation
996.00	LCY	$20.00	$19,920.00	Hauling
63.782	CY	$73.92	$4,714.77	Footing Concrete - 3000 psi - Material
63.782	CY	$22.56	$1,438.92	Footing Concrete - 3000 psi - Labor
1.4399	Ton	$2,283.00	$3,287.29	Footing Reinforcing (#5 bar) Material and Labor
			$212,148.18	

DEMOLITION ESTIMATE				
Item	Unit	Qty	Cost/Unit	Cost
Building 1	C.F.	281250	$0.50	$140,625.00
Building 2	C.F.	41360	$0.50	$20,680.00
Building 3	C.F.	96000	$0.50	$48,000.00
Existing Elementary School	C.F.	415590	$0.49	$203,639.10
Pavement	S.Y.	5769	$9.20	$53,074.80
Concrete	S.F.	2000	$22.00	$44,000.00
Concrete Curbs	L.F.	184	$6.65	$1,223.60
Chain Link Fence	L.F.	1229	$4.12	$5,063.48
Natural Gas Pipe	L.F.	47	$8.20	$385.40
Natural Gas Fittings	EACH	3	$18.50	$55.50
Water Pipes	L.F.	73	$15.30	$1,116.90
Water Fittings	EACH	4	$128.00	$512.00
Oil Tank	EACH	1	$1,200.00	$1,200.00
Misc. Material Hauling	C.Y.	75	$18.80	$1,410.00
			TOTAL:	$520,985.78

Façade Estimate					
Location	Façade Area (SF)	Cost/SF (Low)	Cost/SF (High)	Total Cost (Low)	Total Cost (High)
North	13791.35	$25.00	$40.00	$344,783.75	$551,654.00
South	11389.58	$25.00	$40.00	$284,739.50	$455,583.20
East	3821.54	$25.00	$40.00	$95,538.50	$152,861.60
West	3686.88	$25.00	$40.00	$92,172.00	$147,475.20
				$817,233.75	$1,307,574.00

STRUCTURAL POOL TAKEOFFS					Total
FOUNDATION					
General Excavation					
Item	Quantity	Unit	Waste	Cost/Unit	
Soil Removal, Excavator	4955	BCY	1.00	1.79	8869.45
Soil Hauling, 12CY Truck	6442	LCY	1.10	14.4	102041.28
Footings					
Item	Quantity	Unit	Waste	Cost/Unit	
Strip Footings	1197	LF	1.10	38.5	50692.95
Spread Footing Excavation	100	BCY	1.00	1.79	179.00
Spread Footing Concrete	100	CY	1.10	107	11770.00
Spread Footing Rebar	2.8	TONS	1.10	2,283	7031.64
Slab-On-Grade					
Item	Quantity	Unit	Waste	Cost/Unit	
6" Reinforced Slab	7864	SF	1.10	5.44	47058.18
LOAD BEARING WALLS					
CMU Walls					
Item	Quantity	Unit	Waste	Cost/Unit	
8" CMU's Grouted Solid	4600	SF	1.10	11.08	56064.80
STRUCTURAL STEEL					
Item	Quantity	Unit	Waste	Cost/Unit	
36" Deep Joist	8.856	TON	1.00	3450	30553.20
W36x182	11.193	TON	1.00	3450	38615.85
					$352,876.35

ELECTRICAL POOL TAKEOFFS					Total
OUTLETS					
Item	Quantity	Unit	Waste	Cost/Unit	
4 per 1000 SF w/ Transformer	7854	SF	1.10	2.3	19870.62
LIGHTING					
Pool Area					
Item	Quantity	Unit	Waste	Cost/Unit	
High Bay, HID Fixture w/4 Watts per SF	5876	SF	1.00	10.56	62050.56
T12 40 Watt Lamps	1107	SF	1.00	10.24	11335.68
Underwater Pool Lights	2	EACH	1.00	945	1890
Locker Rooms					
Item	Quantity	Unit	Waste	Cost/Unit	
T12 40 Watt Lamps	814	SF	1.00	10.24	8335.36
MISC					
Item	Quantity	Unit	Waste	Cost/Unit	
Clock/Scoreboard	1	EACH	1.00	3450	3450
Communication System w/ Wiring, Conduits	1	EACH	1.00	13675	13675
					$120,607.22

MECHANICAL POOL TAKEOFFS					Total
VENTILATION					
Item	Quantity	Unit	Waste	Cost/Unit	
Centrifugal Ventilation System	1	EACH	1	10,250	10250.00
AIR CONDITIONING					
Item	Quantity	Unit	Waste	Cost/Unit	
Rooftop Single Zone Cooling, School	7864	SF	1	11.4	89649.60
Hydronic Electric Boiler	7864	SF	1	7.19	56542.16
MISC					
Item	Quantity	Unit	Waste	Cost/Unit	
Gas Pool Heater	1	EACH	1	16,900	16900.00
					$173,341.76

ARCHITECTURAL POOL TAKEOFFS					Total
INTERIOR PARTITIONS					
Item	Quantity	Unit	Waste	Cost/Unit	
8" CMU'S	1460	SF	1.10	9.63	15,465.78
Toilet Partitions Laminate Standard	3	EACH	1.00	693.00	2,079.00
Toilet Partitions Laminate ADA	2	EACH	1.00	1038.00	2,076.00
3' Hollow Metal Doors	4	EACH	1.00	1212.00	4,848.00
STAIRS					
Item	Quantity	Unit	Waste	Cost/Unit	
Standard Stairway, 1 Flight	2	EACH	1.10	11300.00	24,860.00
Bleacher Stairway, 6 Risers	1	EACH	1.00	5000.00	5,000.00
RAILINGS					
Item	Quantity	Unit	Waste	Cost/Unit	
Steel Railings	200	LF	1.00	80.00	16,000.00
SEATING					
Locker Room Benches	6	EACH	1.00	180.00	1,080.00
Bleacher Seating, 3 Rows	120	LF	1.00	55.50	6,660.00
FINISHES					
Locker Rooms					
Item	Quantity	Unit	Waste	Cost/Unit	
Quarry Tile Floor	671	SF	1.10	14.15	10,444.12
Vinyl Composition Tile	448	SF	1.10	2.02	995.46
Painted CMU Walls	1460	SF	1.10	1.79	2,874.74
1/2" Gyp Board Ceiling Painted	814	SF	1.10	4.32	3,868.13
Mirrors	4	EACH	1.00	232.50	930.00
Surface Mounted Towels	2	EACH	1.00	83.50	167.00
Toilet Tissue Dispenser	5	EACH	1.00	38.05	190.25
Main Pool Area					
Item	Quantity	Unit	Waste	Cost/Unit	
1/2" Granolithic Concrete Floor	6700	SF	1.10	4.81	35,449.70
Painted CMU Walls	1430	SF	1.10	1.79	2,815.67
Spray Painted Structure	5943	SF	1.10	0.51	3,334.02
1/2" Gyp Board Ceiling Painted	1107	SF	1.10	4.32	5,260.46
MISC					
Steel Lockers 5' High	12	EACH	1.00	217.00	2,604.00
Wheelchair Lift*	1	EACH	1.00	4459.00	4,459.00
Pool w/ Gunite Shell, Formed Gutters, and Tile Finish	2706	SF	1.00	250.50	677,853.00
Pool Filter System w/ Pump	1	EACH	1.00	2820.00	2,820.00
*usmedicalsupplies.com					$832,134.33

PLUMBING POOL TAKEOFFS					Total
FIXTURES					
Item	Quantity	Unit	Waste	Cost/Unit	
Back to Back Water Closet Pairs	2	EACH	1	4550.00	9,100.00
Wall Hung Water Closet	1	EACH	1	2290.00	2,290.00
Wall Hung Urinal	1	EACH	1	1425.00	1,425.00
Wall Hung Sinks	4	EACH	1	1755.00	7,020.00
Drinking Fountains, Semi-Recessed	2	EACH	1	1870.00	3,740.00
Shower System 30" Square	6	EACH	1	2600.00	15,600.00
Showher Head, Arm, and Handles	6	EACH	1	431.00	2,586.00
PIPING					
Item	Quantity	Unit	Waste	Cost/Unit	
Hotwater, 2" Copper	300	LF	1.1	52.80	17,424.00
Coldwater, 2" Copper	300	LF	1.1	52.80	17,424.00
Waste Pipe, 4" PVC	200	LF	1.1	34.65	7,623.00
MISC					
Item	Quantity	Unit	Waste	Cost/Unit	
Sprinkler System, Light Hazaard, Floor	7864	SF	1	3.51	27,602.64
Gas Fired Water Heater	1	EACH	1	6775.00	6,775.00
					$118,609.64

FUTURE POOL ADDITION ESTIMATE					CURRENT ADD-ALTERNATE DESIGN	
Item	**Unit**	**Qty.**	**Cost/Unit**	**Cost**	**Item**	**Cost**
Facebrick Building w/ CMU backup	S.F.	9,000	$265.07	$2,385,630.00	**Structure**	$352,876.35
Bleachers	L.F.	120	$55.50	$6,660.00	**Mechanical**	$173,341.76
Lockers	EACH	12	$217.00	$2,604.00	**Electrical**	$120,607.22
Benches	EACH	6	$180.00	$1,080.00	**Plumbing**	$118,609.64
Sound System	EACH	1	$13,675.00	$13,675.00	**Architectural**	$832,134.33
Pool Lights	EACH	2	$945.00	$1,890.00		
Scoreboard	EACH	1	$3,450.00	$3,450.00		
			TOTAL:	**$2,414,989.00**	**TOTAL:**	**$1,597,569.30**

STEEL BEAMS AND GIRDERS

Roof

Beam Size	Quantity	Length (ft)	Weight (lbs	$/LF	Cost
W8X10	36	517.27	5210	26.5	13707.655
W10X12	11	230.02	2771	29.5	6785.59
W12X14	17	375.21	5311	32.5	12194.325
W12X16	2	46	737	32.5	1495
W12X19	2	69.51	1317	42	2919.42
W14X22	10	294.67	6507	47.5	13996.825
W16X26	8	267.24	6984	47.5	12693.9
W16X31	28	1087.95	33800	56	60925.2
W18X35	16	464.07	16265	64	29700.48
W18X40	9	267.06	10723	72	19228.32
W21X44	1	33.83	1497	77	2604.91
			91122		$176,251.63

2nd Floor

Beam Size	Quantity	Length (ft)	Weight (lbs	$/LF	Cost
W8X10	48	567.12	5712	26.5	15028.68
W10X12	10	186.12	2242	29.5	5490.54
W12X14	16	360.16	5098	32.5	11705.2
W8X15	1	15.84	239	34	538.56
W12X16	4	93	1491	32.5	3022.5
W12X19	3	73.74	1398	42	3097.08
W14X22	19	592.76	13091	47.5	28156.1
W16X26	10	356.38	9313	47.5	16928.05
W16X31	28	1033.37	32104	56	57868.72
W18X35	14	469.42	16453	64	30042.88
W18X40	18	529.9	21277	72	38152.8
W21X44	4	114.17	5050	77	8791.09
W21X48	1	27.49	1319	86.5	2377.885
W21X50	2	73.33	3668	86.5	6343.045
			118455		$227,543.13

3rd Floor

Beam Size	Quantity	Length (ft)	Weight (lbs	$/LF	Cost
W8X10	48	565.54	5696	26.5	14986.81
W10X12	9	156.3	1883	29.5	4610.85
W12X14	16	361.83	5122	32.5	11759.475
W8X15	1	15.84	239	34	538.56
W12X16	7	175.39	2811	32.5	5700.175
W12X19	1	22.69	430	42	952.98
W14X22	13	382.18	8440	47.5	18153.55
W16X26	17	601.38	15716	47.5	28565.55
W16X31	25	1003.95	31190	56	56221.2
W18X35	17	487.67	17092	64	31210.88
W18X40	16	463.73	18620	72	33388.56
W21X44	3	86.33	3819	77	6647.41
W24X55	5	170	9371	94.5	16065
			120429		$228,801.00

1st Floor

Beam Size	Quantity	Length (ft)	Weight (lbs	$/LF	Cost
W8X10	17	188.19	1895	26.5	4987.035
W10X12	6	131.21	1580	29.5	3870.695
W12X14	8	192.55	2726	32.5	6257.875
W12X16	14	410	6571	32.5	13325
W12X19	1	28.83	546	42	1210.86
W14X22	2	52	1148	47.5	2470
W16X26	5	177.33	4634	47.5	8423.175
W18X40	1	33.9	1361	72	2440.8
W36X135	3	160.75	21716	219	35204.25
			42177		$78,189.69

JOISTS

Joist Size	Quantity	Length (ft)	Weight (lbs	$/Unit	Cost
28K6	3	160.75	1833	14.7	2363.025
XXGSP	9	482.25	0		0
			0.9165		2363.025

STEEL COLUMNS

Column Size	Quantity	Length (ft)	Weight (lbs	$/LF	Cost
W10X33	57	2118	69981	77	163086
W10X39	15	602	23557	77	46354
W14X43	1	45	1929	122	5490
W10X45	2	51	2308	77	3927
W14X48	2	62	2975	122	7564
W10X49	11	366	17934	113	41358
			118684		$267,779.00

Total Weight of Steel

Beams	186.0915	
Columns	59.342	
Joists	0.9165	
Total	**246.35**	
	x 110%	Add 10% for nuts, bolts, plates, angles
Total Steel	**270.985**	

Total Steel Costs

	Cost	Weight
Beams	$710,785.45	186.0915
Columns	$294,556.90	59.342
Joists	$4,726.05	0.9165
Accessories	$84,990.75	24.635
	$1,095,059.15	**270.985**
Location Factc	98.8	
Final Cost	**$1,081,918.44**	

Appendix D: LEED PLANS

LEED INFORMATION FOR ALL CONSTRUCTION MANAGEMENT CREDITS PURSUED

SS Credit 1: Site Selection

1 Point

Our site meets all requirements. It is NOT on:

- Prime Farmland
- Previously undeveloped land
- Land for a habitat of an endangered species
- Land within 100 feet of wetlands
- Land that was parkland

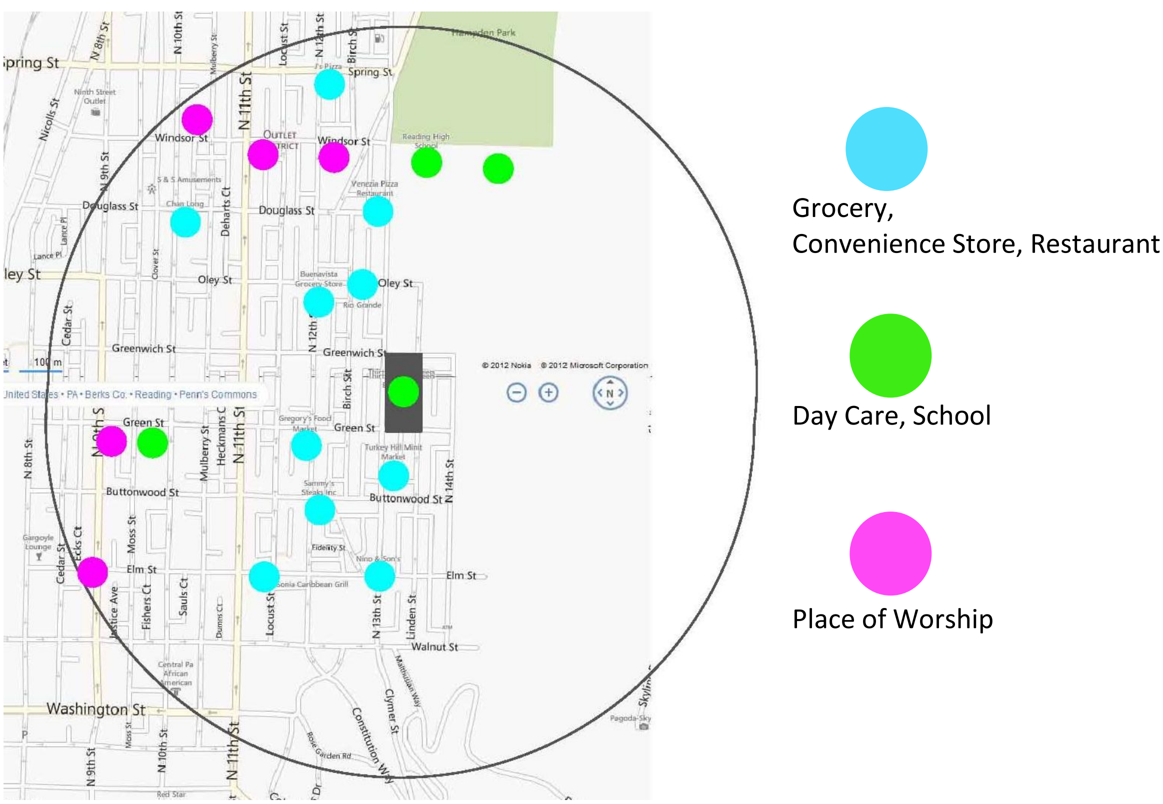
1 POINT

SS Credit 2: Development Density and Community Connectivity

4 Points

Constructed on a site that:

- Is located on a previously developed site
- Is within ½ mile of a residential area or neighborhood with density of 10 units per acre
- Within ½ mile of at least 10 basic services (see map below)
- Has pedestrian access between the building and the services



4 POINTS

SS Credit 3: Brownfield Redevelopment
1 Point

Rehabilitating a damaged site where development is complicated by environmental contamination.

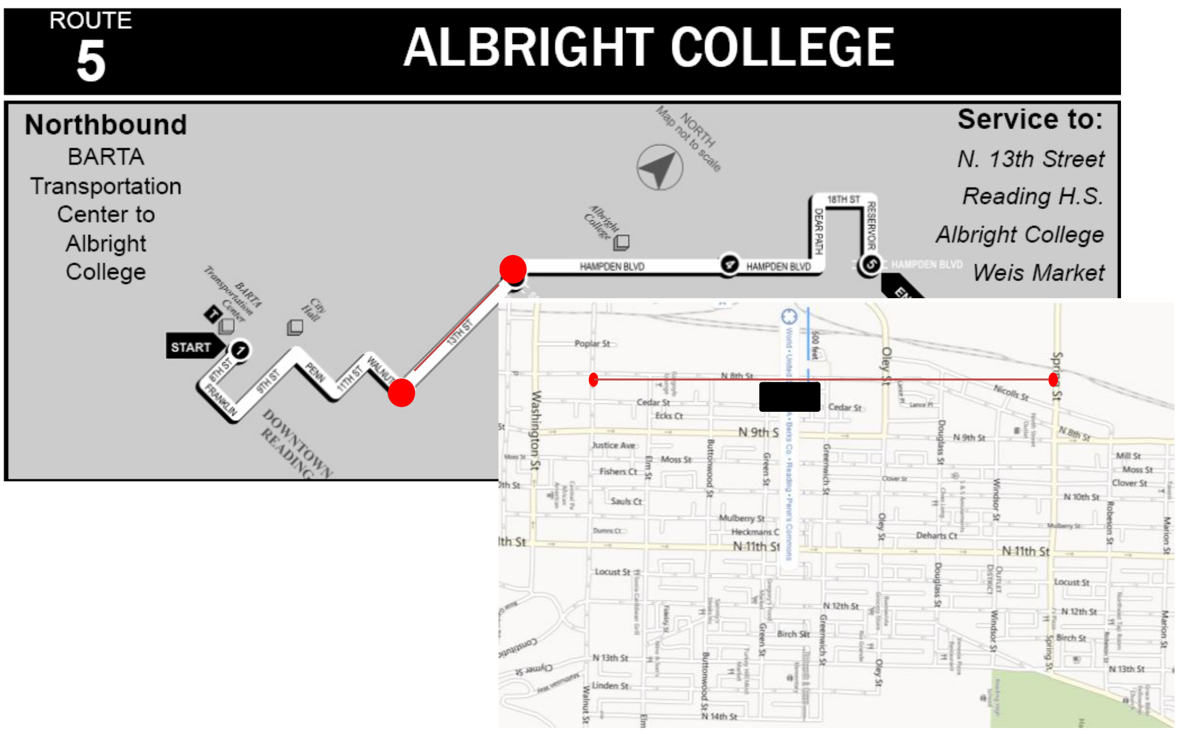
- Because soil contamination is present because of paint from one of the existing buildings, we will remediate this problem to protect the health of students

1 POINT

SS Credit 4.1: Alternative Transportation-Public Transportation Access
4 Points

Having a bus stop for two or more bus lines within ¼ mile of the main entrance of the school in addition to providing walking or biking lanes from the school to the transit lines.

- School bus system can count as one and BARTA has a route that goes along 13th street. Either use existing stop (2) or add stop along route.



4 POINTS

SS Credit 4.2: Alternative Transportation – Bicycle Storage and Changing Rooms
1 Point

- Providing bike racks within 200 yards of a building entrance which we will do
- Providing showers which will be in the locker rooms of the pool area
- Providing dedicated bike lanes to the end of the school property in 2 or more directions with no barriers which will be on all roadways on our school property

1 POINT

SS Credit 4.4: Alternative Transportation – Parking Capacity
2 Points

Provide only the number of spaces required by local zoning and provide preferred parking for carpools

- 68 spots x 0.05% = 3.4 – 4 spots

2 POINTS

SS Credit 5.1: Site Development – Protect or Restore Habitat
1 Point

Previously Developed Sites

- Include native PA plants on 20 % of the entire site, including the building footprint: 307x574x.2= 35,000 sq. ft. for whole block; 186x574x.2=22,000 sq. ft. exclude existing

1 POINT

SS Credit 5.2 Site Development – Maximize Open Space
1 Point

Sites with Zoning Ordinances but No Open Space Requirements

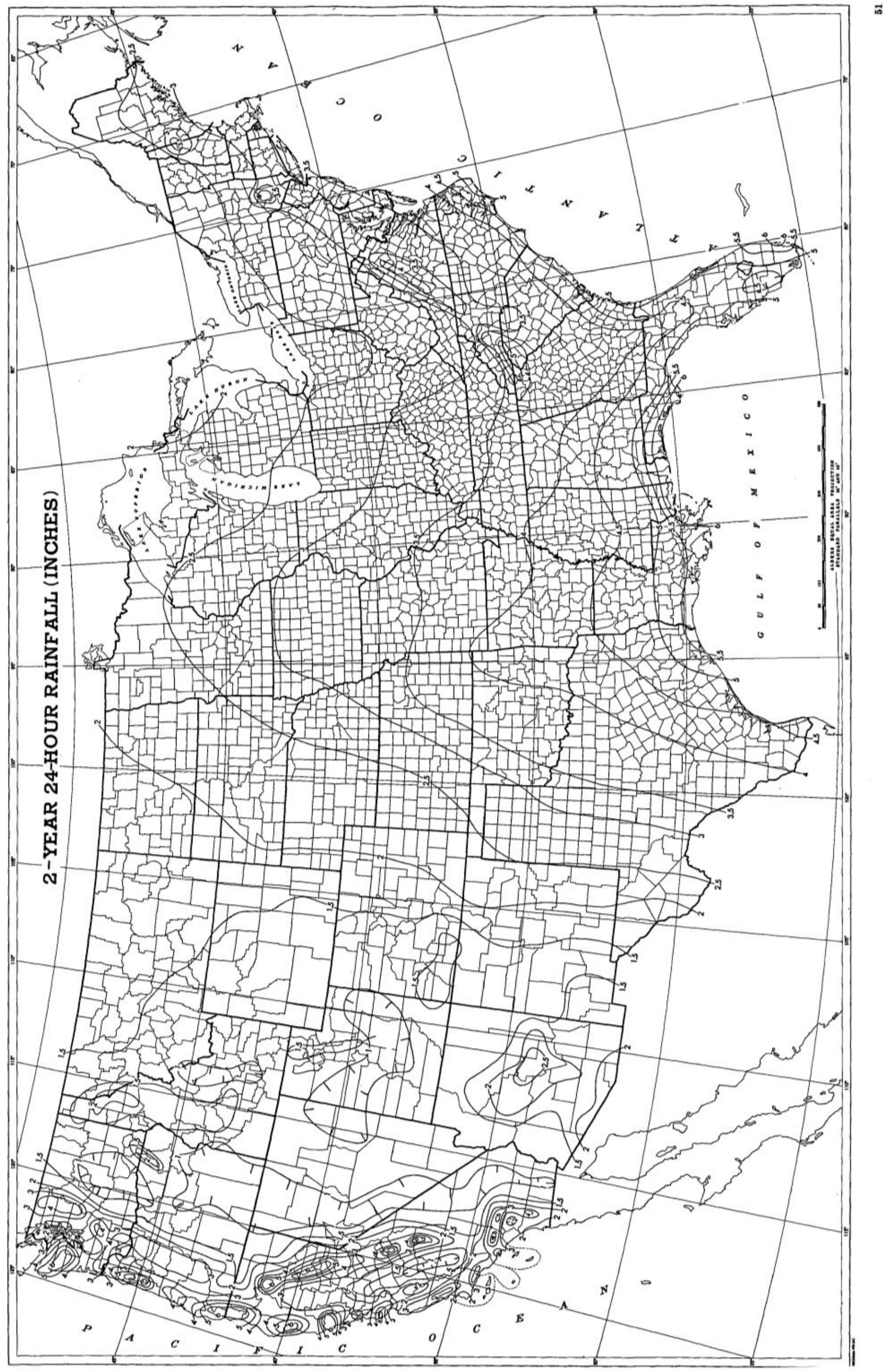
- Could not find any open space requirements, so we simply need 20 % of open vegetation which is what we will obtain from SS Credit 5.1

1 POINT

SS Credit 6.1: Stormwater Design – Quantity Control
1 Point

Limit natural hydrology on a site with existing imperviousness greater than 50%

- Use rainwater collection and vegetation to decrease volume of stormwater runoff by 25% from the 2-year 24-hour design storm which is between 3 and 3.5 inches.



1 POINT

MR Prerequisite 1: Storage and Collection of Recyclables
Required

Provide designated areas through each phase of construction for

- Paper
- Corrugated cardboard
- Glass
- Plastics
- Metals

REQ

MR Credit 2: Construction Waste Management
1-2 Points

Recycle/salvage nonhazardous construction and demolition debris. Large opportunity during demolition phase to recycle materials from existing buildings:

- Cardboard
- Metal
- Brick
- Mineral fiber panel
- Concrete
- Plastic
- Clean wood
- Glass
- Gypsum wallboard
- Carpet
- Insulation

50% gets 1 LEED point

1 POINT

MR Credit 5: Regional Materials
1-2 Points

Use building products within 500 miles of the building site. Façade has already been estimated to be almost 10 % of building value and SlenderWall is within range. Possible other components of the building:

- High Steel in Lancaster, PA http://www.highsteel.com/
- Cemex near Pittsburgh http://www.cemexusa.com/
- Casework possibly from http://www.wood-metal.com/products/ (lots of LEED possibilities there)

With the addition of a few more materials, especially for finishes, 20% can be achieved.

2 POINTS

MR Credit 7: Certified Wood
1 Point

Using a minimum of 50% of FSC wood products based on cost.

- Formwork from places like 84 lumber that carry FSC wood products
- Casework possibly from http://www.wood-metal.com/products/ (lots of LEED possibilities there)

1 POINT

IEQ Credit 3.1: Construction Indoor Air Quality Management Plan – During Construction
1 Point

Must meet SMACNA IAQ Guidelines for buildings under construction, protect on-site and installed absorptive materials from moisture damage, replace all filtration media immediately prior to occupancy, prohibit smoking inside the building and within 25 feet of the building

1. Identify all potential sources of odor and dust
2. Locate occupied areas potentially affected by the project
3. Identify construction activities likely to produce dust or odor in occupied areas
4. Classify potential IAQ problems by severity
5. Identify available control options
6. Select specific control measures

Important to have protected storage areas, perhaps by getting a portion of the building done quickly to store stuff.

1 POINT

IEQ Credit 3.2 Construction Indoor Air Quality Management Plan – Before Occupancy
1 Point

Air Testing – Conduct baseline IAQ testing after construction ends and prior to occupancy, testing against the EPA Compendium of Methods for the Determination of Air Pollutants in Indoor Air.

- Important to leave time in the schedule for this process to take place
- Cannot exceed following values:

Contaminant	Maximum Concentration
Formaldehyde	27 parts per billion
Particulates (PM10)	50 micrograms per cubic meter
Total volatile organic compounds (TVOCs)	500 micrograms per cubic meter
4-Phenylcyclohexene (4-PCH)*	6.5 micrograms per cubic meter
Carbon monoxide (CO)	9 part per million and no greater than 2 parts per million above outdoor levels

*This test is required only if carpets and fabrics with styrene butadiene rubber (SBR) latex backing are installed as part of the base building systems.

1 POINT

IEQ Credit 4: Low Emitting Materials
1-4 Points

Reduce indoor contaminants. Easiest two are Flooring Systems and Furniture and Furnishings because lots of products are either GREENGAURD or meet the California Department of Health Services Standard

2 POINTS

ID Credit 1: Innovation in Design
1-4 Points

For each credit pursued, a detailed writing will be made displaying:

- The intent of the proposed credit
- The proposed requirement for compliance

- The proposed submittals to demonstrate compliance
- The design approach used to meet the requirements

Most likely at least one point will be achieved from doing this.

1 POINT

ID Credit 3: The School as a Teaching Tool
1 Point

Once all of our Green initiatives have been decided on, we must decide upon how using the school as a teaching tool will be used by the teachers. Must:

- Provide 10 hours of teaching per year per student
- Display the relationship between human ecology, natural ecology, and the building
- Must be approved by school

1 POINT

Appendix E: CODE ANALYSIS

Section 349.16 of the Pennsylvania School Code states that school buildings must follow these codes or professional guidelines:

CEFP	Council of Educational Facilities Planners 29 West Woodruff Avenue, Columbus; OH 43210
USSGSL	United States Standard Guide for School Lighting 345 East 47th Street, New York, NY 10017
IES	Illuminating Engineering Society 345 East 47th Street, New York, NY 10017
ANSI	American National Standards Institute 1430 Broadway, New York, NY 10018
ASHRAE	American Society of Heating, Refrigeration and Airconditioning Engineers United Engineering Center 345 East 47th Street, New York, NY 10017
NPC	National Plumbing Code Part of ANSI
NEC	National Electric Code Part of ANSI
AGA	American Gas Association 605 Third Avenue, New York, NY 10016
ASTM	American Society for Testing and Materials 1916 Race Street, Philadelphia, PA 19103
ASME	American Society for Mechanical Engineers United Engineering Center 345 E. 47th Street, New York, NY 10017
NFPA	National Fire Protection Association 60 Batterymarch Street, Boston, MA 02110 (Usually included in ANSI)
SMACNA	Sheet Metal Contractors National Association—Standards 1611 North Kent Street, Arlington, VA 22209
EFL	Educational Facilities Laboratories 477 Madison Avenue, New York, NY 10022
OSHA	Pennsylvania Department of Labor and Industry Harrisburg, PA 17120
BOCA	Building Officials and Code Administrators International Inc. 1313 East 60th St. Chicago, IL 60637

Code	Section	Title
The Pennsylvania Code	349.5	Building Space Allocation
The Pennsylvania Code	349.6	Building Design
The Pennsylvania Code	349.7	Approval of Sites
The Pennsylvania Code	349.11	Aggregate Building Expenditure Standard; Act 34 of 1973
International Building Code	Chapter 3	Use and Occupancy Classification
International Building Code	Chapter 5	General Building Heights and Areas
International Building Code	Chapter 6	Types of Construction
International Building Code	Chapter 7	Fire & Smoke Protection Features
International Building Code	Chapter 9	Fire Protection Systems
International Building Code	Chapter 10	Means of Egress

PA CODE 349.5 BUILDING SPACE ALLOCATIONS

(a) *Elementary schools.* The amount of space included in the schedule of space allocations for an elementary school shall approximate 58 square feet for each student in approved full-time equivalent project enrollment

(b) *Exceptions.* Any departure of 10% or more from the established expectancy levels for the scheduled area of a project shall require justification and approval from the Department.

The floor area square footage is approximately 83,000 SF (without the swimming pool), meaning, based on building square footage, that the enrollment could hold a maximum of around 1,573 full-time equivalent students (FTE).

PA CODE 349.6 BUILDING DESIGN

(a) *Design tolerances.* Any design ratio of architectural space to scheduled space which exceeds 1.58 to 1.0 shall require approval from the Department

Scheduled Area (Instructional Spaces)						TOTAL
Room	**S.F.**	**Room**	**S.F.**	**Room**	**S.F.**	
104	6141	202	613	302	133	
109	468	207	201	303	223	
110	251	208	1931	304	257	
111	159	209	407	309	201	
112	77	211	72	310	875	
113	295	212	1143	311	812	
119	353	213	536	312	792	
121	123	215	1545	313	801	
122	200	216	667	314	816	
123	80	217	687	316A	756	
132	1453	218	690	317	687	
134	765	219	294	318	687	
135	789	222	1108	319	690	
136	789	223	1022	324	1112	
140	1109	224	1022	325	1081	
141	1081	225	1022	326	1081	
142	1081	226	1022	327	1081	
143	1081	227	1041	328	1081	
144	1081	233	912	329	1101	
145	1114	234	991			
155	943	235	867			
159	892	236	847			
160	891					
	21216		18640		14267	**54,123**
Architectural Space						**83,000**
Ratio						**1.53**

PA CODE 349.7 APPROVAL OF SITES

(a) *Approvable size.* Usable acreage as follows shall be considered optimum: elementary schools—10 acres; schools for middle grades—20 acres, schools for high school grades—35 acres; and part-time vocational-technical schools—15 acres.

The size of the site when incorporating the entire city block is roughly 180,000 SF, which is much less than the limit of 10 acres (436,000 SF) specified by PA Code 349.7.(a).

PA CODE 349.11 AGGREGATE BUILDING EXPENDITURE STANDARD; ACT 34 OF 1973

(a) *Rated pupil capacity.* For the purpose of computing the aggregate building expenditure standard of a project, the rated pupil capacity shall be determined on the basis of the method used by the Department for school building reimbursement purposes during the school year 1971-1972.

(b) *1971-1972 method.* Rated pupil capacity shall be determined in accordance with the following formulae:

(1) *Elementary building.* The rated pupil capacity for an elementary building equals the sum of the capacity points for classrooms, special education, kindergarten, in accordance with the following chart:

Elementary Buildings			
Size (SF)	**Number**	**Points**	**Act 34 Capacity**
550-659	0	24	0
660-769	6	32	192
770-849	8	34	272
850+	24	35	840
		TOTAL	**1304**

IBC 2009 CHAPTER 3 USE AND OCCUPANCY CLASSIFICATIONS

Section 303.1 Exception 4. Assembly areas that are accessory to Group E occupancies are not considered separate occupancies except when applying the assembly occupancy requirements of Chapter 11. A-4 Assembly uses intended for viewing of indoor sporting events and activities with spectator seating including, but not limited to arenas, skating rinks, swimming pools, and tennis courts.

Section 305.1 Educational Group E. Educational Group E occupancy includes, among others, the use of a building or structure, or a portion thereof, by six or more persons at any one time for educational purposes through the 12th grade.

IBC 2009 CHAPTER 5 GENERAL BUILDING HEIGHTS AND AREAS

TABLE 503
ALLOWABLE BUILDING HEIGHTS AND AREAS[a]
Building height limitations shown in feet above grade plane. Story limitations shown as stories above grade plane.
Building area limitations shown in square feet, as determined by the definition of "Area, building," per story

		TYPE OF CONSTRUCTION								
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
	HEIGHT(feet)	UL	160	65	55	65	55	65	50	40
GROUP				STORIES(S) AREA (A)						
A-I	S A	UL UL	5 UL	3 15,500	2 8,500	3 14,000	2 8,500	3 15,000	2 11,500	1 5,500
A-2	S A	UL UL	11 UL	3 15,500	2 9,500	3 14,000	2 9,500	3 15,000	2 11,500	1 6,000
A-3	S A	UL UL	11 UL	3 15,500	2 9,500	3 14,000	2 9,500	3 15,000	2 11,500	1 6,000
A-4	S A	UL UL	11 UL	3 15,500	2 9,500	3 14,000	2 9,500	3 15,000	2 11,500	1 6,000
A-5	S A	UL UL	UL UL	UL UL	UL UL	UL UL	UL UL	UL UL	UL UL	UL UL
B	S A	UL UL	11 UL	5 37,500	3 23,000	5 28,500	3 19,000	5 36,000	3 18,000	2 9,000
E	S A	UL UL	5 UL	3 26,500	2 14,500	3 23,500	2 14,500	3 25,500	1 18,500	1 9,500

IBC 2009 CHAPTER 6 TYPES OF CONSTRUCTION

TABLE 601
FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (hours)

BUILDING ELEMENT	TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
	A	B	A[d]	B	A[d]	B	HT	A[d]	B
Primary structural frame[g] (see Section 202)	3[a]	2[a]	1	0	1	0	HT	1	0
Bearing walls Exterior[f, g]	3	2	1	0	2	2	2	1	0
Bearing walls Interior	3[a]	2[a]	1	0	1	0	1/HT	1	0
Nonbearing walls and partitions Exterior	See Table 602								
Nonbearing walls and partitions Interior[e]	0	0	0	0	0	0	See Section 602.4.6	0	0
Floor construction and secondary members (see Section 202)	2	2	1	0	1	0	HT	1	0
Roof construction and secondary members (see Section 202)	1 1/2[b]	1[b, c]	1[b, c]	0[c]	1[b, c]	0	HT	1[b, c]	0

IBC 2009 CHAPTER 3 USE AND OCCUPANCY CLASSIFICATIONS

Section 702.1 Definitions.

Fire Area – aggregate floor area enclosed and bounded by fire walls, exterior walls, or horizontal assemblies.

Fire Wall – a fire resistance rated wall having protected openings which restricts the spread of fire and extends continuously from the foundation to or through the roof with sufficient structural stability under fire conditions to allow collapse of construction on either side without collapse of the wall.

Fire Barrier – a fire resistance rated wall assembly of materials designed to restrict the spread of fire in which continuity is maintained

IBC CHAPTER 9 FIRE PROTECTION SYSTEMS

Section 903.2.1.4 Group A-4. An *automatic sprinkler system* shall be provided for Group A-4 occupancies where one of the following conditions exists:

1. The *fire area* exceeds 12,000 SF
2. The *fire area* has an *occupant load* of 300 or more
3. The *fire area* is located on a floor other than a *level of exit discharge* serving such occupancies

Section 902.2.3 Group E. An *automatic sprinkler system* shall be provided for Group E occupancies

IBC CHAPTER 10 MEANS OF EGRESS

Section 1004.7 Fixed Seating. For areas having fixed seating and *aisles* the *occupant load* shall be determined by the number of fixed seats installed therein. The *occupant load* for areas in which fixed seating is not installed, such as waiting spaces and *wheel-chair* spaces, shall be determined in accordance with Section 1004.1.1 and added to the number of fixed seats. For areas having fixed seating without dividing arms, the *occupant load* shall not be less than the number of seats based on one person for each 18 inches of seating length.

Maximum Occupancies by Area (by table 1004.1.1)	
Area	**Occupancy**
Average Classroom	45
Multipurpose	877
Community Room	160
Library	38
Pool	54
Pool Deck	180
Pool Seating	120
Locker Rooms	20

Section 1005.1 Minimum Egress Width. The total width of means of egress in inches shall not be less than the total *occupant load* served by the *means of egress* multiplied by 0.3 inches per occupant for stairways and by 0.2 inches per occupant for other egress components. Multiple *means of egress* shall be sized such that the loss of one shall not reduce the available capacity to less than 50% of the required capacity

(234 occupants in pool area)/2 exits x 0.3 inches = 35 inch wide stairways minimum
(234 occupants in pool area)/1.5 exits x 0.3 inches = 47 inch wide stairways needed in the case that one is inaccessible. Increase to 48 inches because of Section 1007.3 Stairways.

(234 occupants in pool area)/2 exits x 0.2 inches = 24 inches wide for other parts of egress path
(234 occupants in pool area)/1.5 exits x 0.2 inches = 32 inches wide for other parts of egress path in the case that an exit is inaccessible.

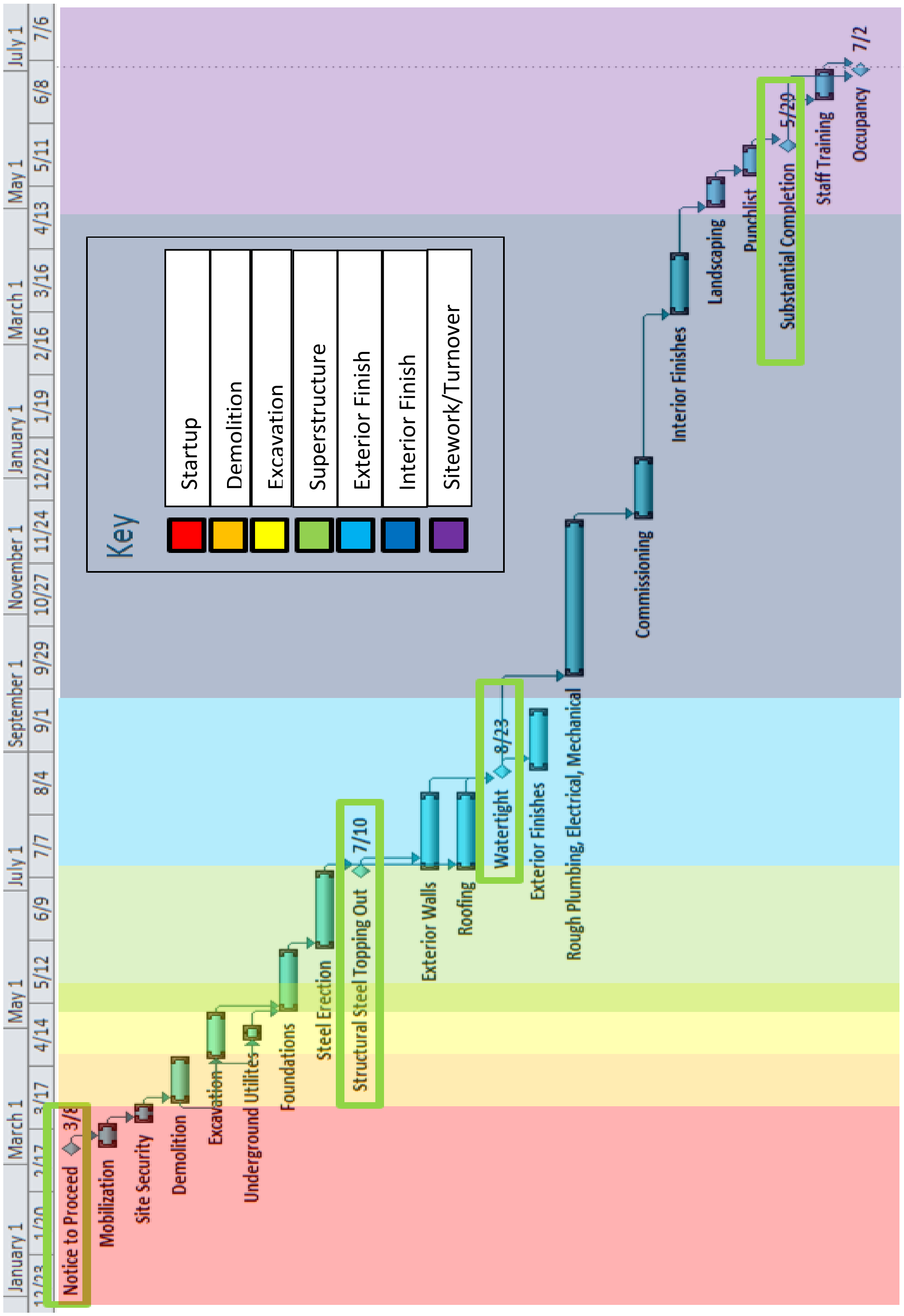
Section 1007.5 Platform lifts. Shall not serve as a part of an *accessible means of egress*.

Section 1007.5.1 Openness. Platform lifts on an *accessible means of egress* shall not be installed in a fully enclosed hoistway

Section 1007.6.1 Size. Each *area of refuge* shall be sized to accommodate one *wheelchair space* of 30 inches by 48 inches for each 200 occupants, based on the *occupant load of the area of refuge* and areas served by the *area of refuge*

Appendix F: SCHEDULES

Procurement Schedule of Major Deliveries						
Item	Submittal to CM	Submittal to Owner/Architect	Reviewed Submittal to CM	Order Date	Lag Time	Delivery Date
Steel Mill Order	3/8/2013	3/11/2013	3/25/2013	3/27/2013	10 weeks	6/5/2013
Electrical Switchgear	10/7/2013	10/18/2013	11/1/2013	11/4/2013	4 weeks	12/2/2013
Electrical Transformer	9/18/2013	9/20/2013	10/4/2013	10/7/2013	8 weeks	12/2/2013
Electrical Generator	8/21/2013	8/23/2013	9/6/2013	9/9/2013	12 weeks	12/2/2013
Plumbing Equipment	10/16/2013	10/18/2013	11/1/2013	11/4/2013	4 weeks	12/2/2013
Façade Materials	3/27/2013	3/29/2013	4/12/2013	4/15/2013	12 weeks	7/8/2013
HVAC Air Handling Equipment	7/17/2013	7/19/2013	10/4/2013	10/7/2013	8 weeks	12/2/2013
Rebar Shop Drawings	3/22/2013	3/25/2013	4/8/2013	4/10/2013	4 weeks	5/8/2013


January 1
March 1
May 1
July 1
September 1
November 1
January 1
March 1
May 1
July 1
12/23
1/20
2/17
3/17
4/14
5/12
6/9
7/7
8/4
9/1
9/29
10/27
11/24
12/22
1/19
2/16
3/16
4/13
5/11
6/8
7/6
Notice to Proceed
3/8
Mobilization
Site Security
Demolition
Excavation
Underground Utilites
Foundations
Steel Erection
Structural Steel Topping Out
7/10
Exterior Walls
Roofing
Watertight
8/23
Exterior Finishes
Rough Plumbing, Electrical, Mechanical
Commissioning
Interior Finishes
Landscaping
Punchlist
Substantial Completion
5/29
Staff Training
Occupancy
7/2
Key
Startup
Demolition
Excavation
Superstructure
Exterior Finish
Interior Finish
Sitework/Turnover

Appendix G: REFERENCES & RESOURCES

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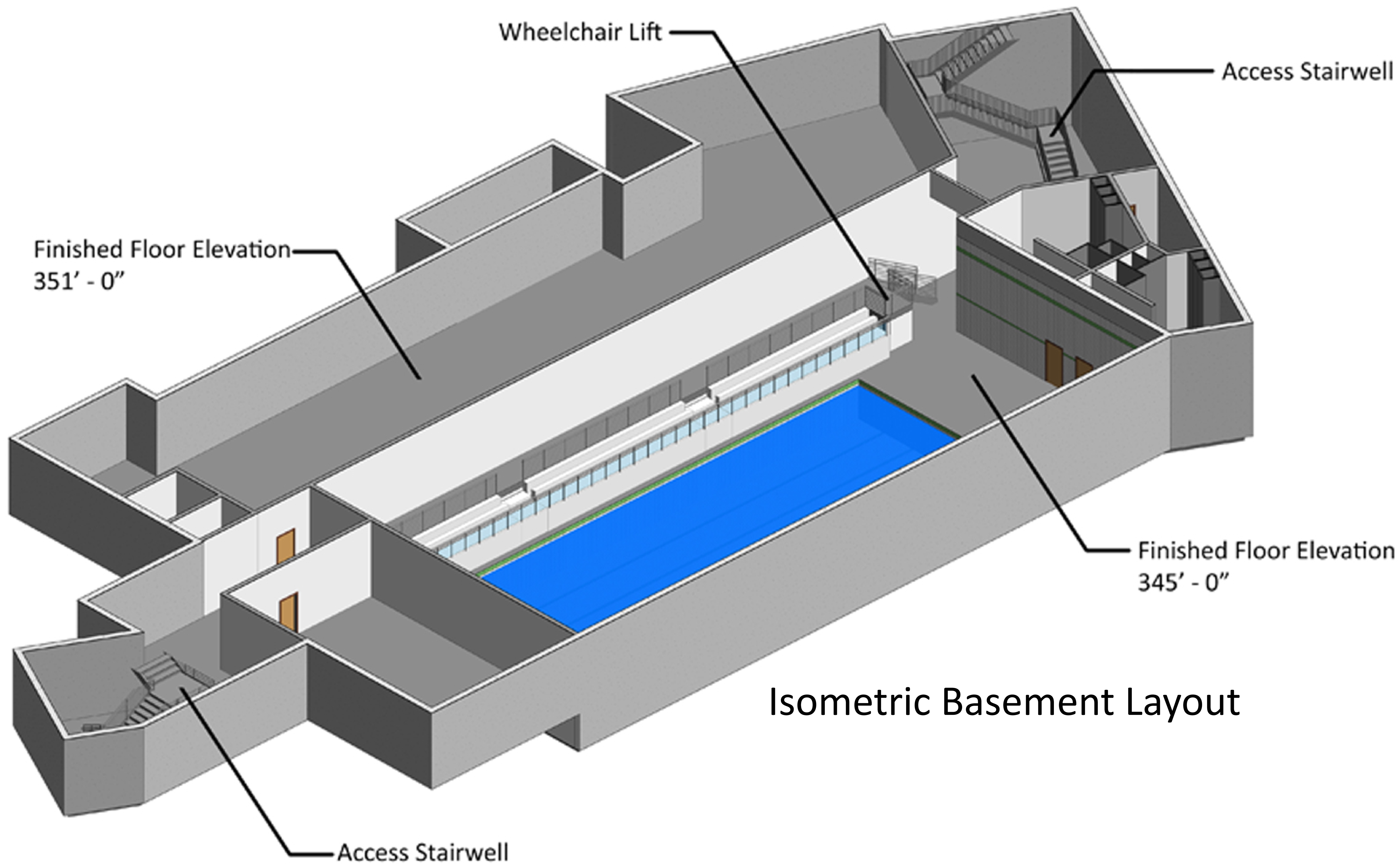
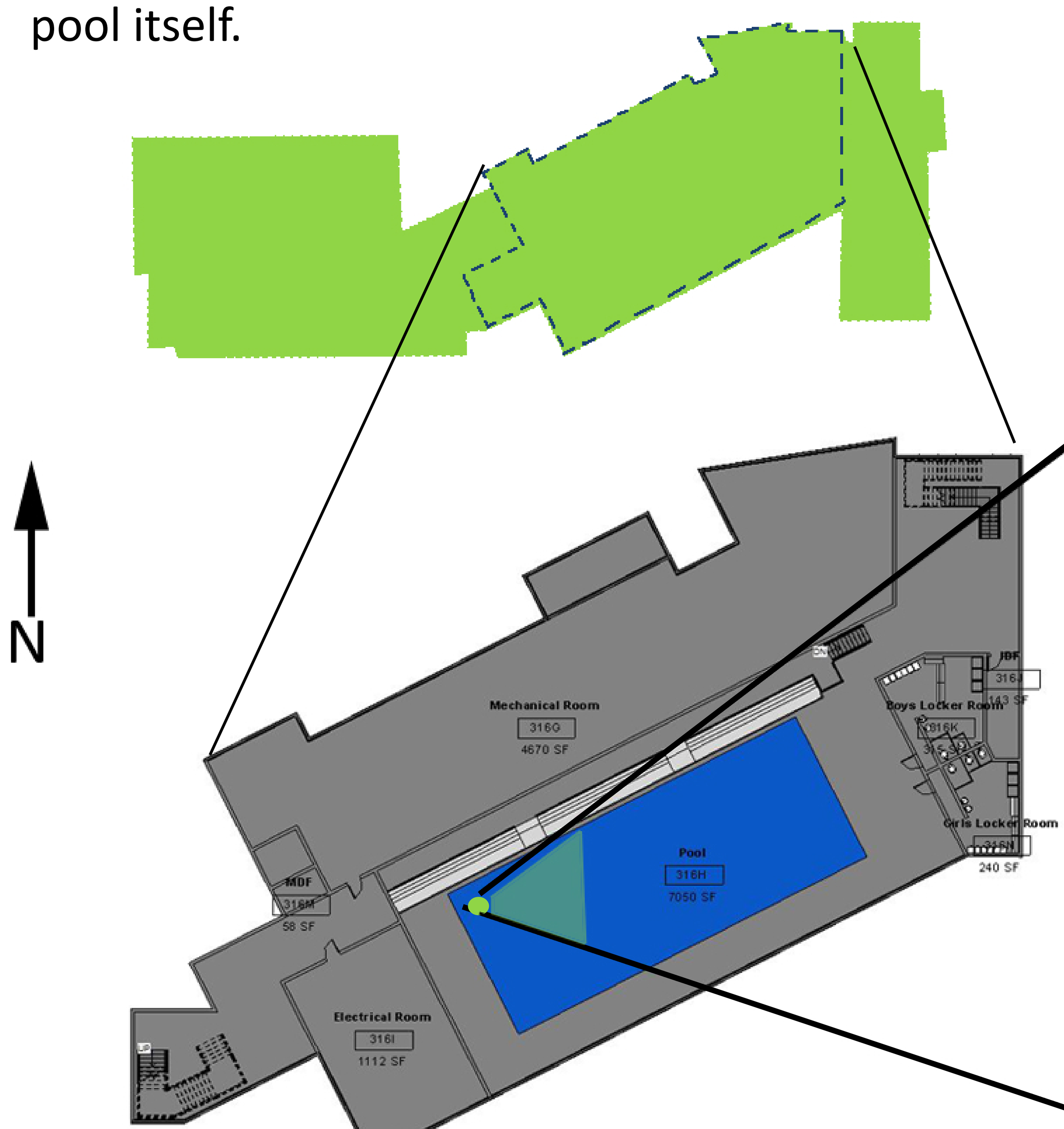
"Playground Design and Equipment." *Whole Building Design Guide.* Ruth, Linda. 3 June 2008. Web. 18 February 2013 <http://www.wbdg.org/resources/playground.php>

The proposed add-alternate for the community pool addition was designed to maximize the available site area by not making significant changes to the building footprint. The original basement layout will simply be extended to house the pool, and structure in that area will be reinforced using poured concrete bearing walls and deep floor joists. The extra area gained on site with this design will allow room for a community playground and a more centralized parking lot. It will also help to gain both open site and permeable cover LEED points as well as turn the RES into a centralized hub to be enjoyed by the community. It is recommended that the city of Reading approve for this add alternate to gain the benefits of a reduced cost when compared to a future pool addition in a seperate building

Design features include a pool deck area six feet below the normal basement elevation for optimum viewing, a 120 person seating area, a timeclock, a sound system, highly visible locker room entrances for the safety of children, and the 6 lane, 25 meter pool itself.



Isometric Basement Layout



Scale: 3/64" = 1'-0"

Swimming Pool Perspective

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Elem School

Basement Layout

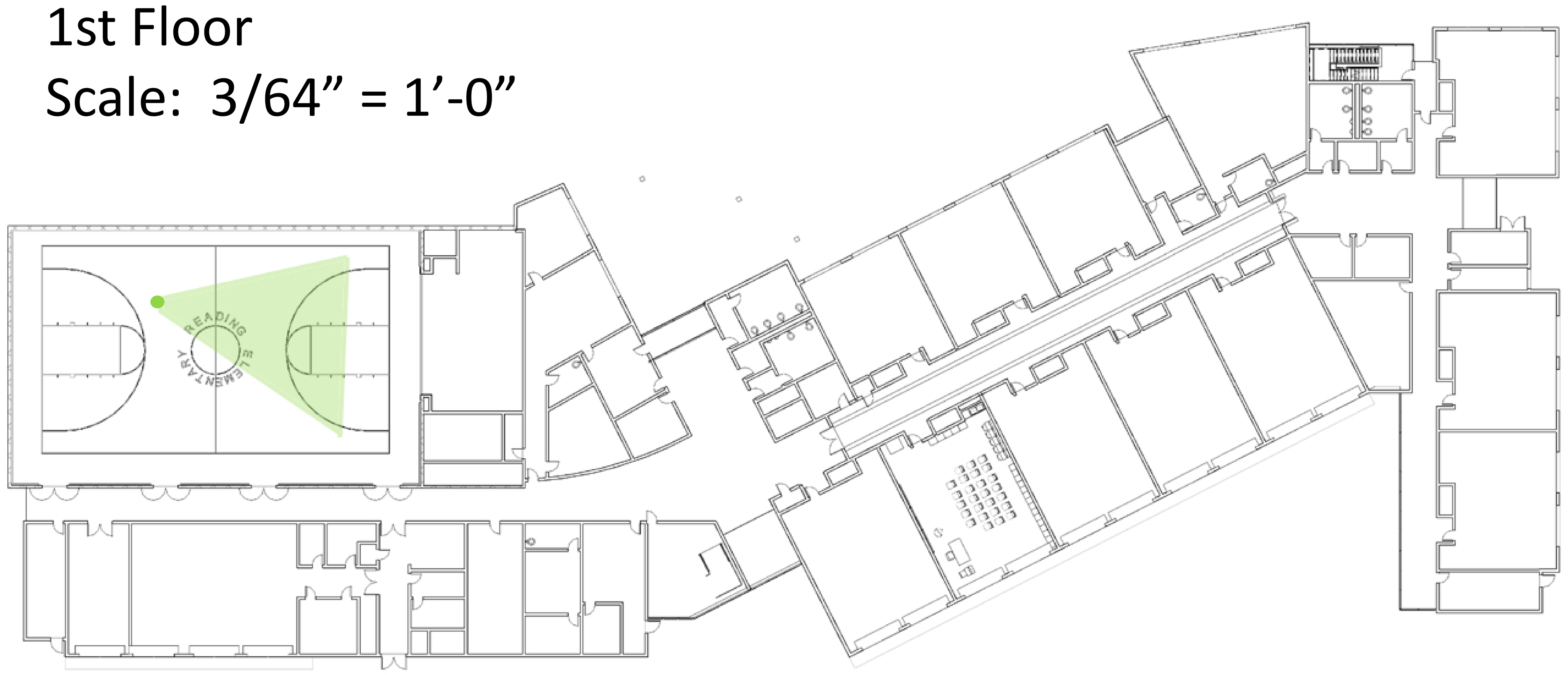
Project Number	1
Date	2/22/13
Drawn By	AEI 10-2013
Checked By	NA

CM-100

Scale

2/19/2013 11:52:06 PM

1st Floor
Scale: 3/64” = 1’-0”



2nd Floor
Scale: 3/64” = 1’-0”

3rd Floor
Scale: 3/64’ = 1’-0”

Multipurpose Room Perspective

Typical Hallway Perspective

Green Roof Perspective

In each of the three floors of RES, the design team wanted to showcase the theme of “using he building as a learning tool.” This will help to gain LEED credits and will also turn the school into an immersive learning environment for students so that they can learn the importance of green building technology. A Typical Classroom has exposed systems (see Summary Narrative Figure 4) and the theme is continued in spaces like the Multipurpose room and Hallways. On the third floor, the Geen Roof can be accessed through the Large Group Instruction area. The Green Roof is not only environmentally friendly, but can also be a unique learning environment.

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Reading

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Floor Plans

Project Number	1
Date	2/22/13
Drawn By	ORGANIC
Checked By	Checker

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Scale

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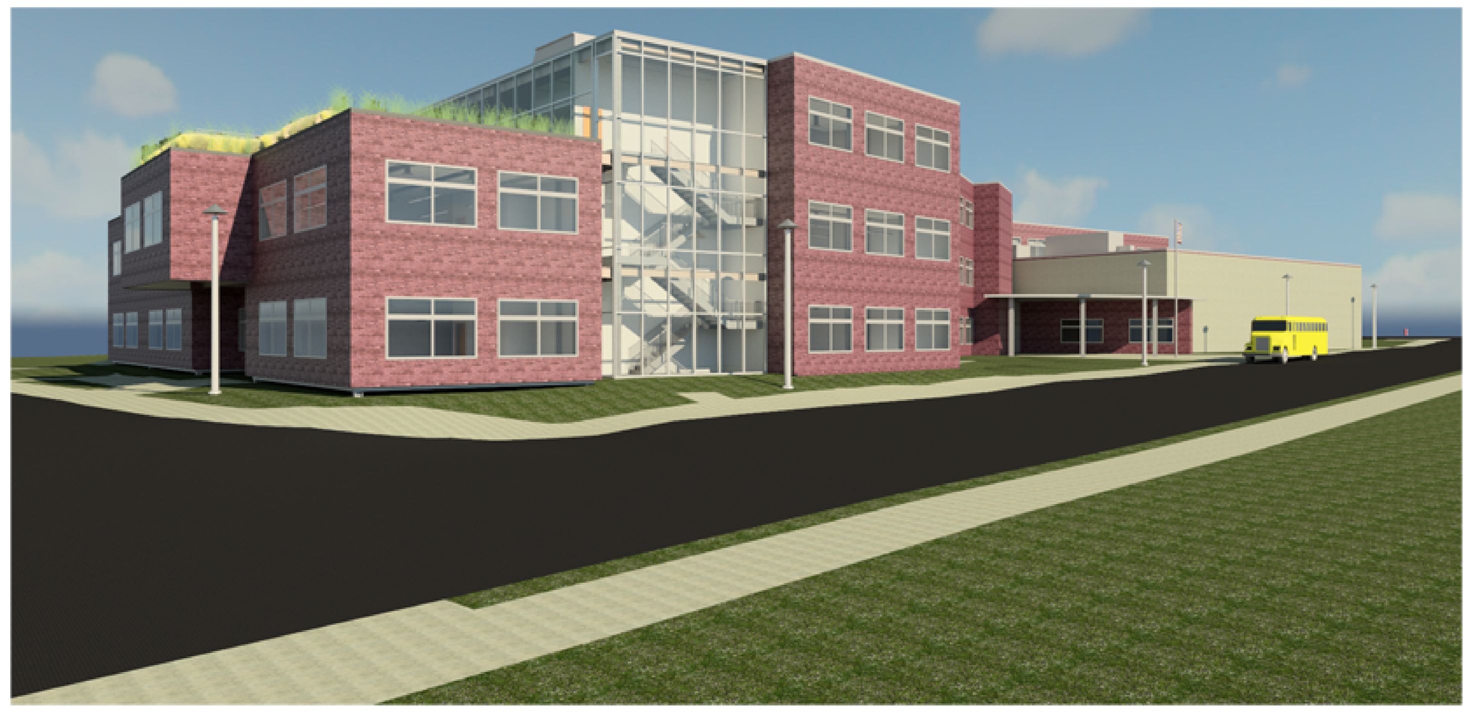
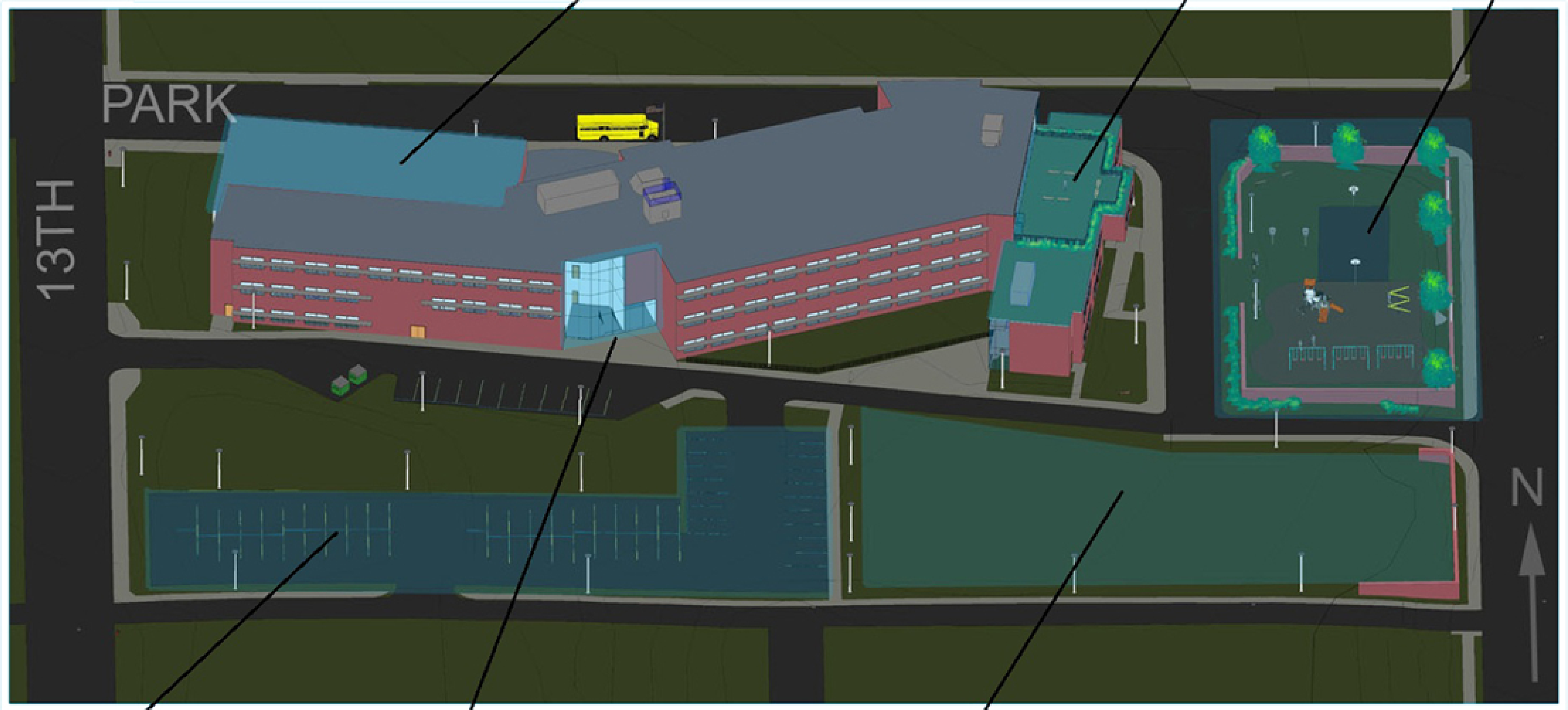
Northwest Perspective

Northeast Perspective

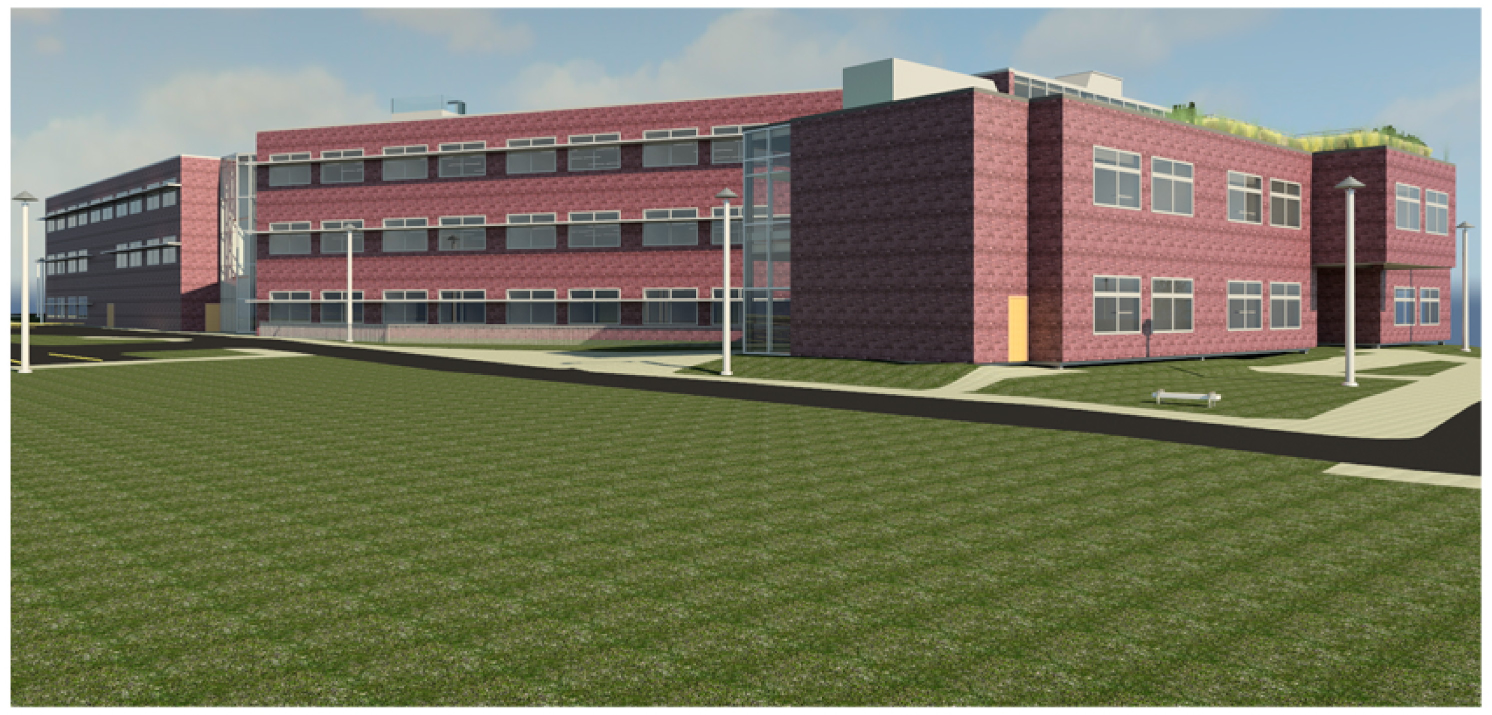


One of the design goals was to enhance security for RES. Some of the measures taken to achieve this include a well-lit site, an architectural security wall around the playground, and a more convenient parking lot location to reduce walking distance to the secure, centralized entrance. Also, the multipurpose room has been strengthened structurally so that it can behave as an emergency shelter for the community. From a construction standpoint, using Revit to model the design features helps to find constructability problems early, before they can reach the field



Playground Perspective

Southwest Perspective



Southeast Perspective

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Elem School

Site Plan

Project Number	1
Date	2/22/13
Drawn By	ORGANIC
Checked By	NA

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Scale

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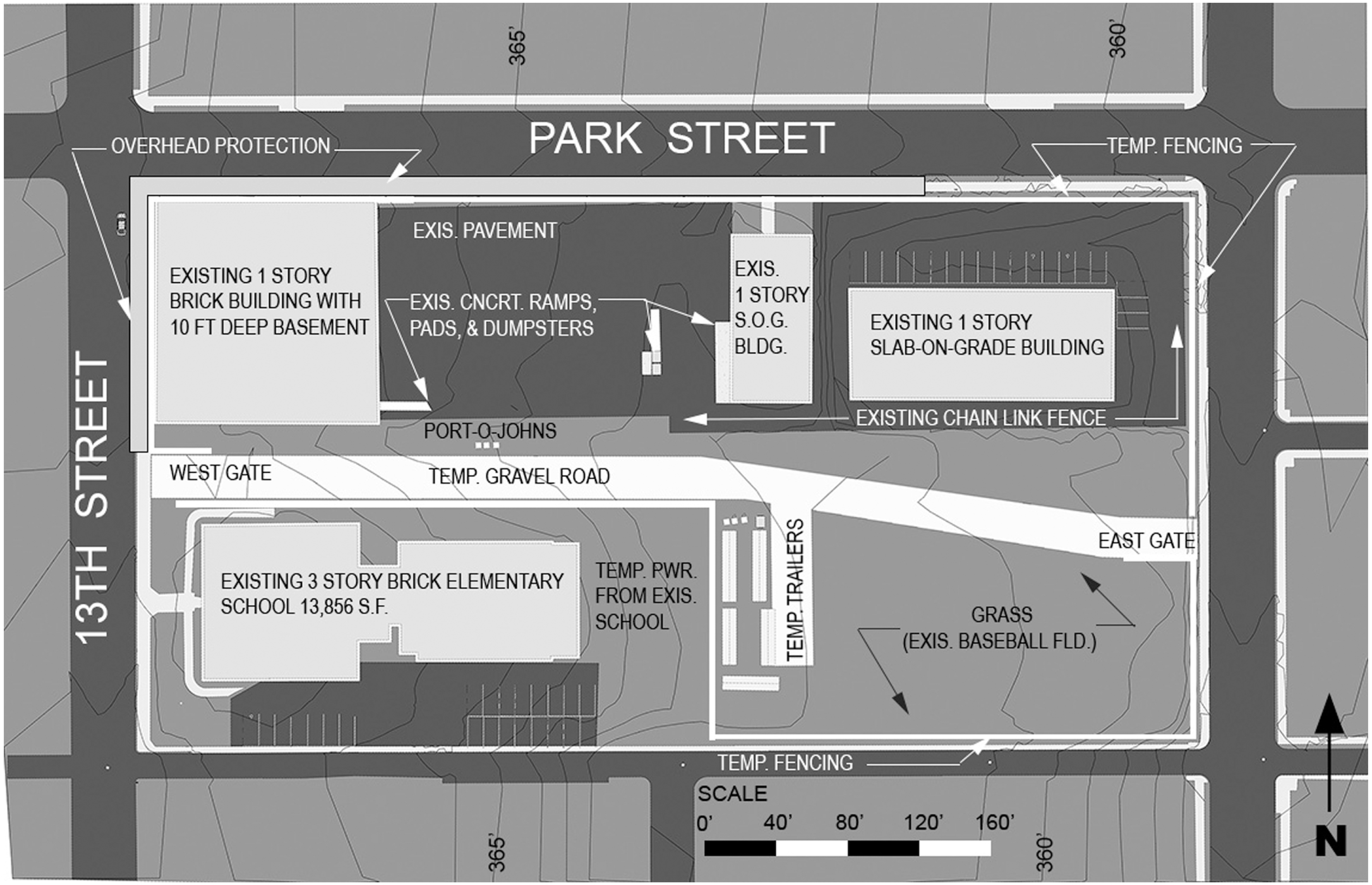
STARTUP: March 8, 2013

SAFETY CONCERNS: Park Street traffic, children in school, and close sidewalk proximity

QUALITY CONTROL: Properly isolating construction site to alleviate disturbance to the city of Reading



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Startup

Project Number	1
Date	2/22/13
Drawn By	ORGANIC
Checked By	NA

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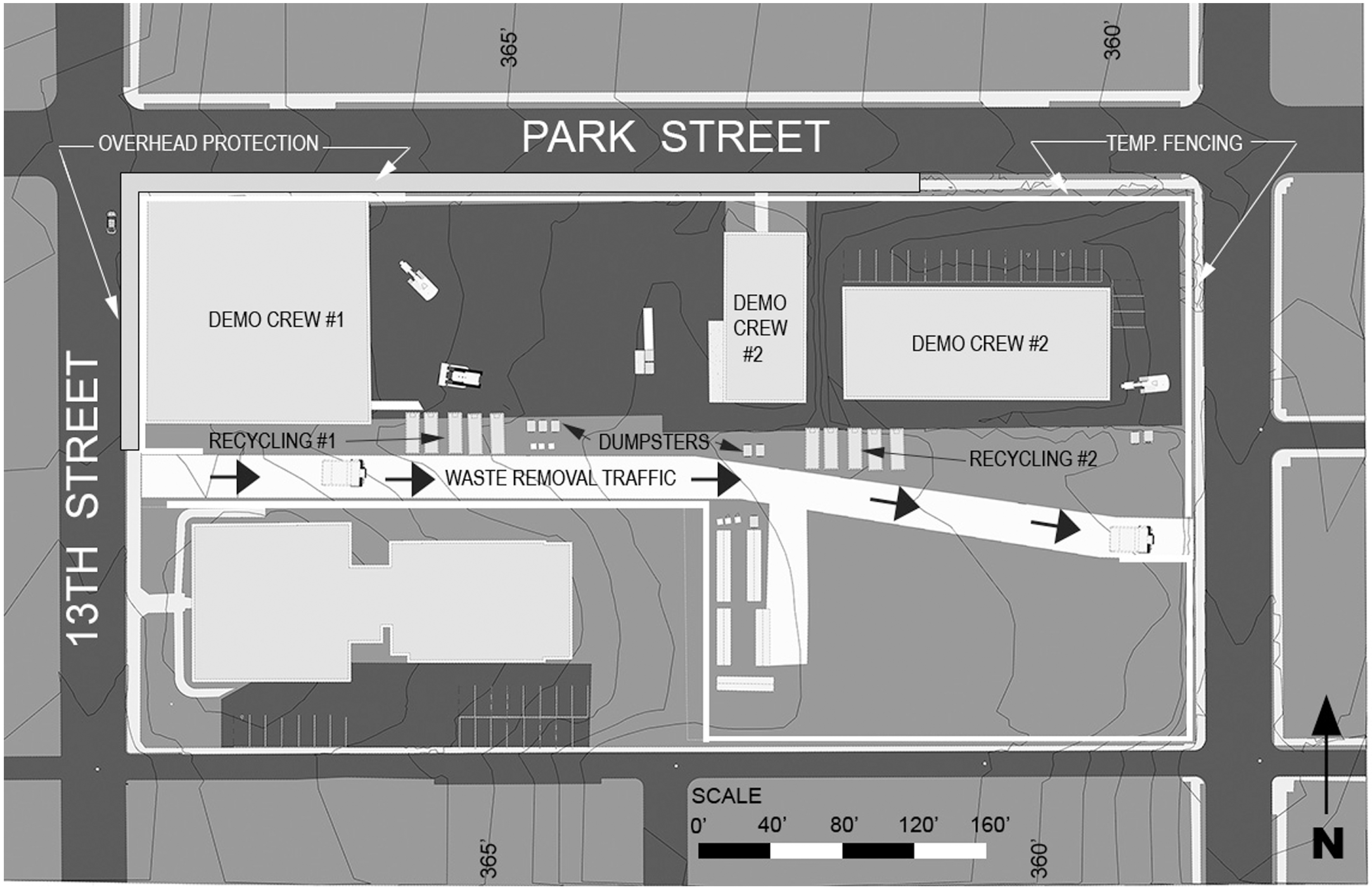
DEMOLITION: March 18, 2013
SAFETY CONCERNS: Falling debris and possible lead paint and asbestos contamination
QUALITY CONTROL: Efficient recycling and material salvaging plan



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Elem School

Demolition

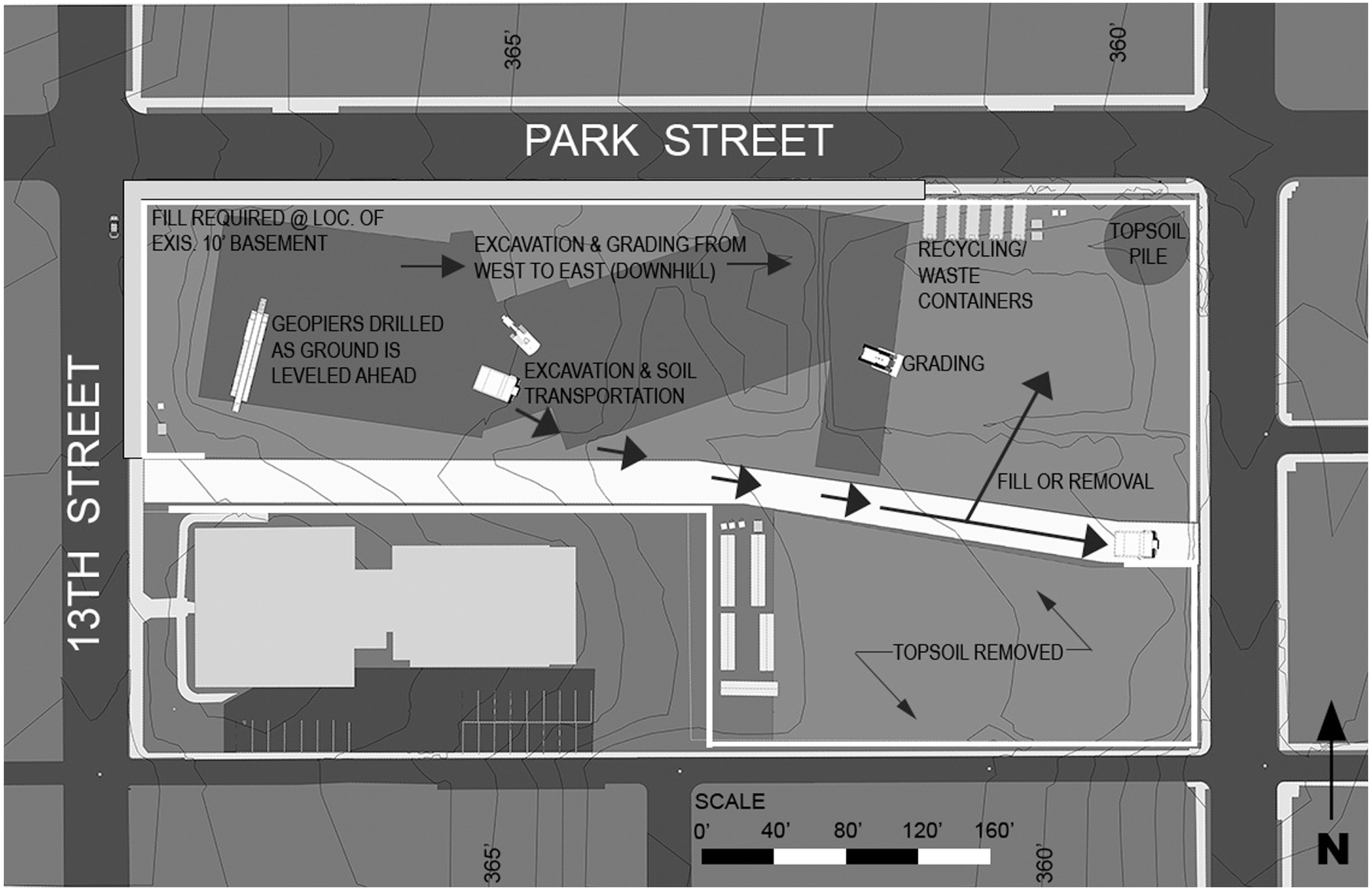
Project Number	1
Date	2/22/13
Drawn By	ORGANIC
Checked By	NA

CM-202

Scale

2/19/2013 11:53:05 PM

EXCAVATION: April 15, 2013
SAFETY CONCERNS: Open excavation pits, sinkholes, and possible contaminated soil
QUALITY CONTROL: Testing of soil for contaminants and limiting the amount of soil being eroded by rain and trailed by vehicles



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Elem School

Excavation

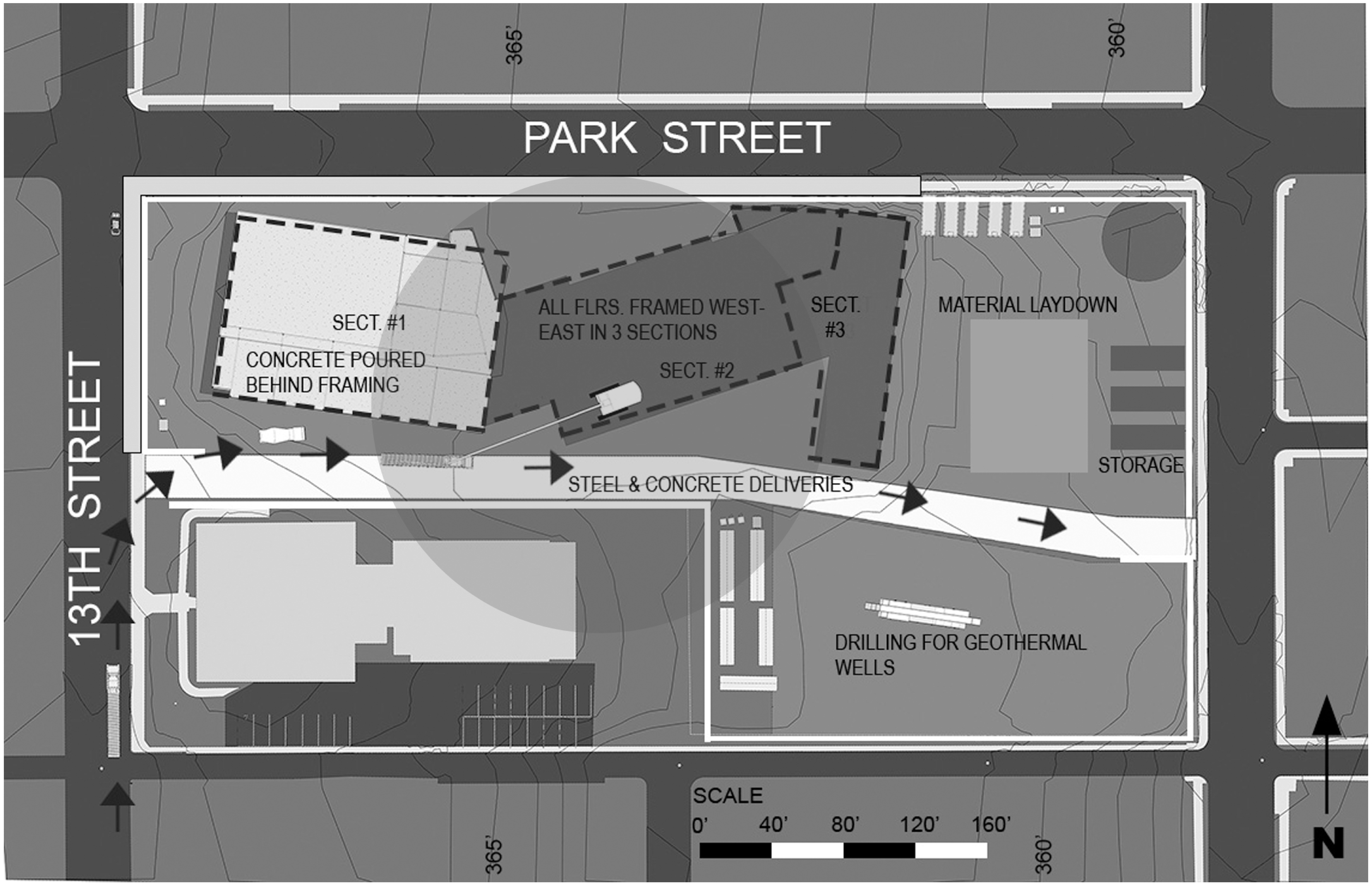
Project Number	1
Date	2/22/13
Drawn By	AEI 10-2013
Checked By	Checker

CM-203

Scale

2/19/2013 11:53:19 PM

SUPERSTRUCTURE: April 29, 2013
SAFETY CONCERNS: Site congestion, crane swing, and frequent truck deliveries
QUALITY CONTROL: Completing sections of the building at a time to phase trades and provide sheltered areas for material storage



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Superstructure

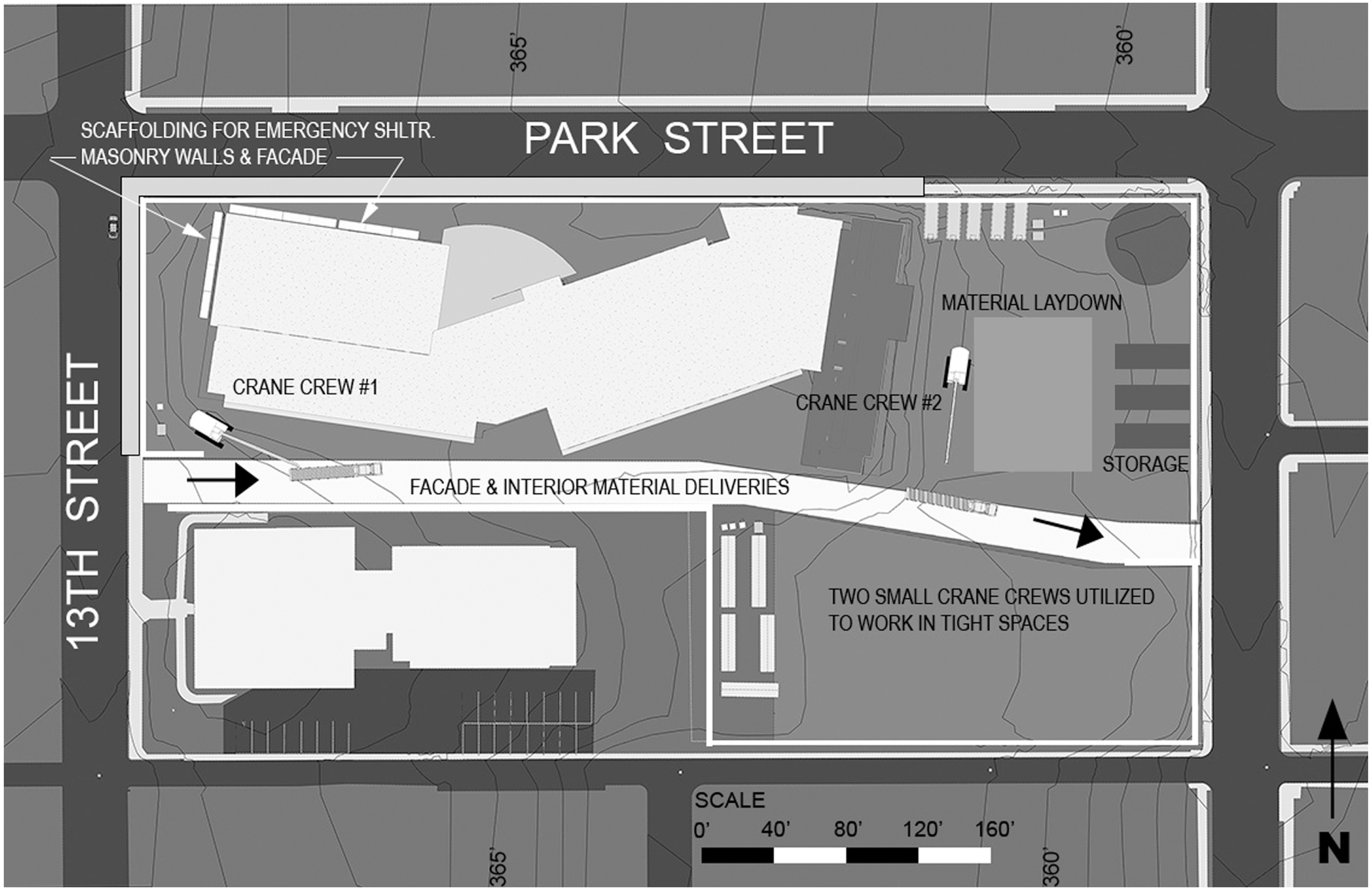
Project Number	1
Date	2/22/13
Drawn By	ORGANIC
Checked By	NA

CM-204

Scale

2/19/2013 11:53:34 PM

EXTERIOR FINISH: July 1, 2013
SAFETY CONCERNS: Site congestion, scaffolding, and truck deliveries
QUALITY CONTROL: Getting the building water tight as soon as possible will help to alleviate some problems associated with weather



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Reading

Elem School

Exterior Finish

Project Number	1
Date	2/22/13
Drawn By	ORGANIC
Checked By	NA

CM-205

Scale

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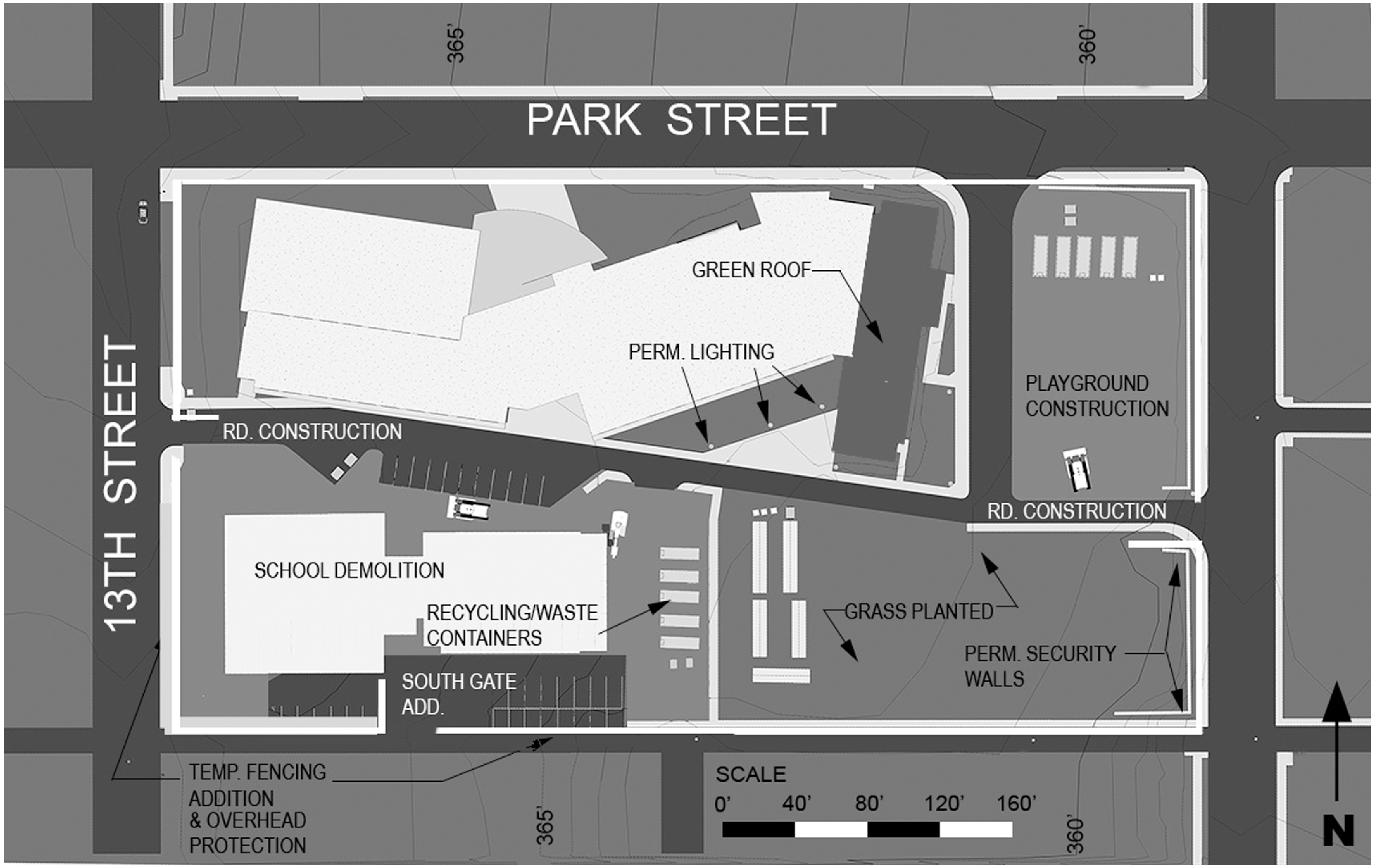
SITEWORK: April 14, 2014
SAFETY CONCERNS: Falling debris and contaminants in demolition materials
QUALITY CONTROL: Recycling and salvaging of materials and cleaning up the site in finished areas



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Elem School

Sitework

Project Number	1
Date	2/22/13
Drawn By	AEI 10-2013
Checked By	NA

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Scale

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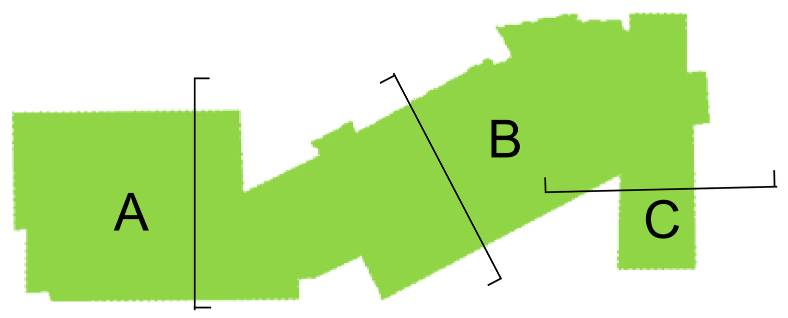
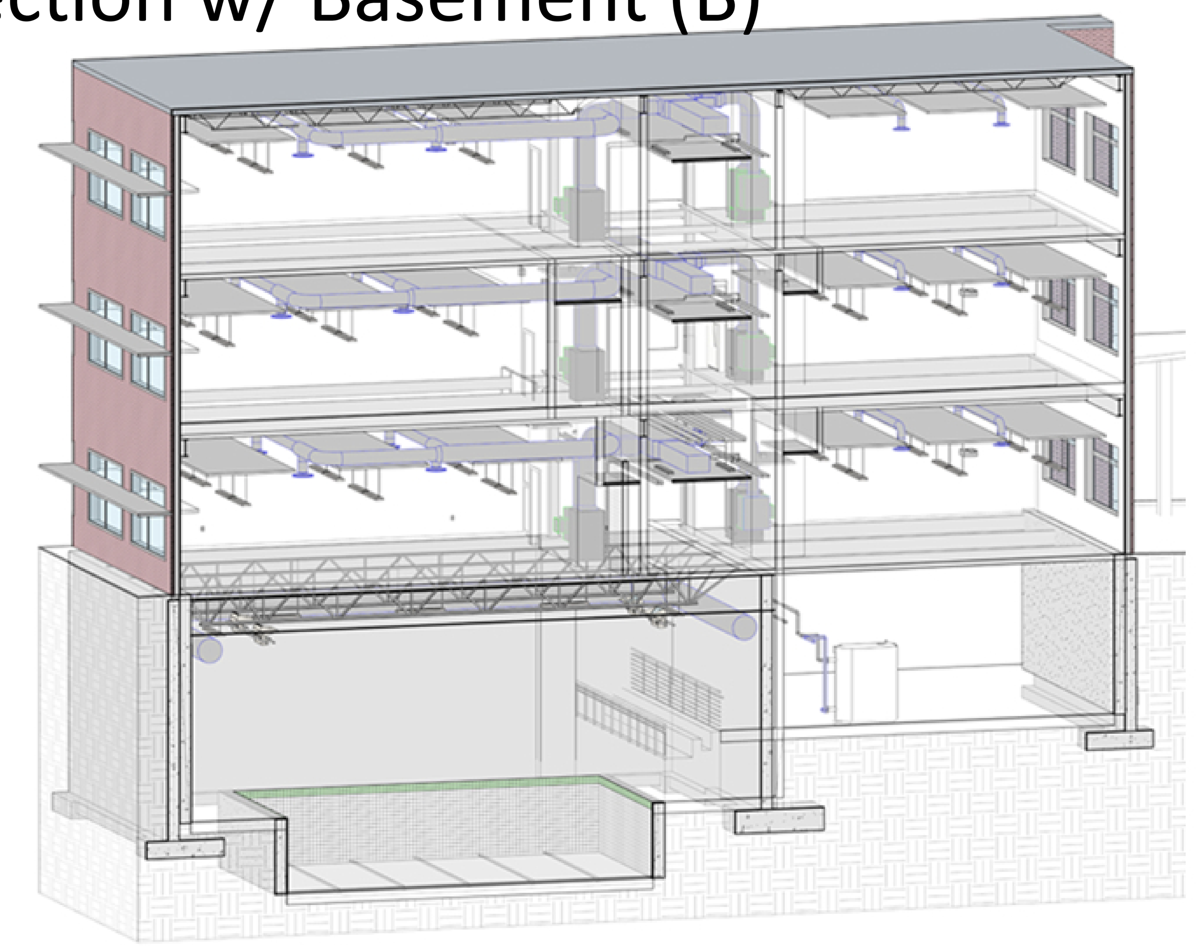
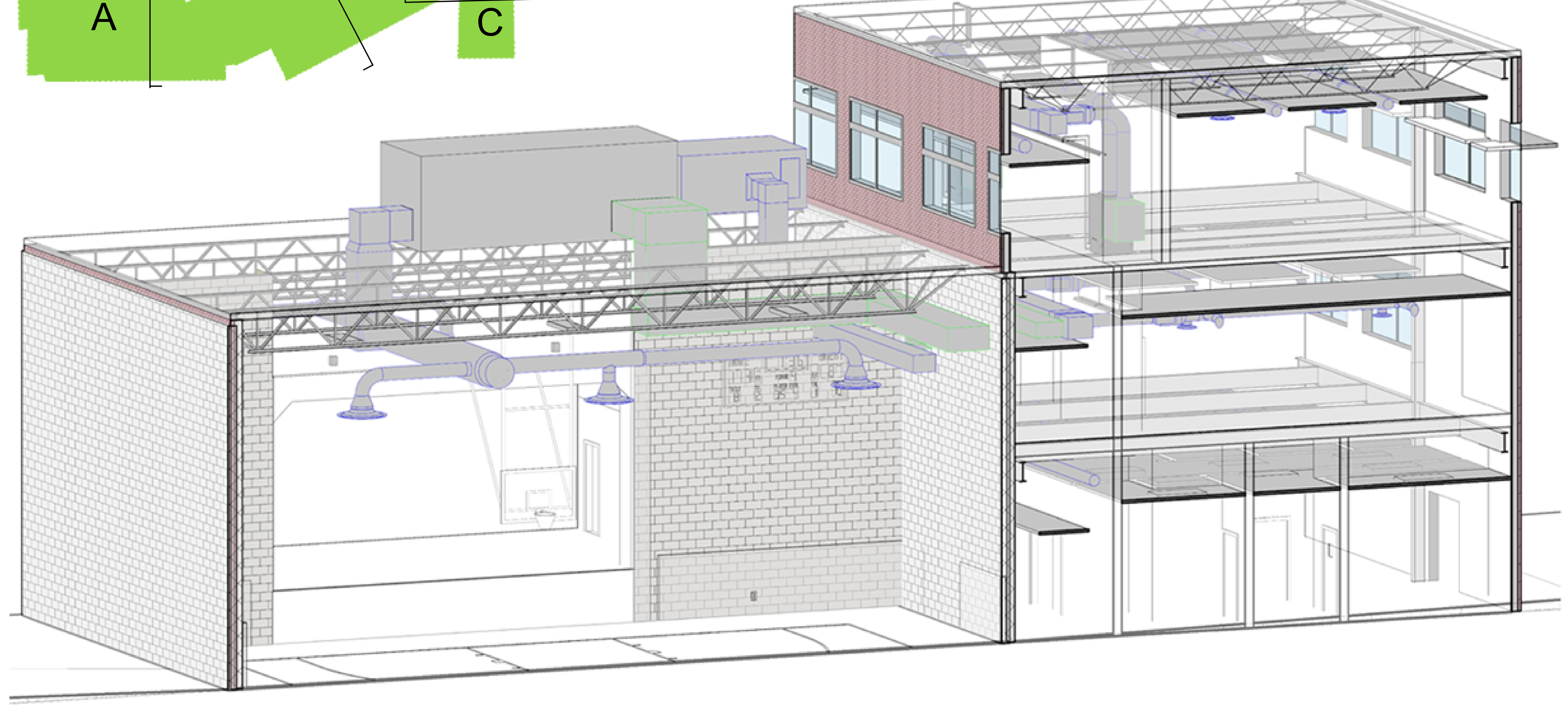
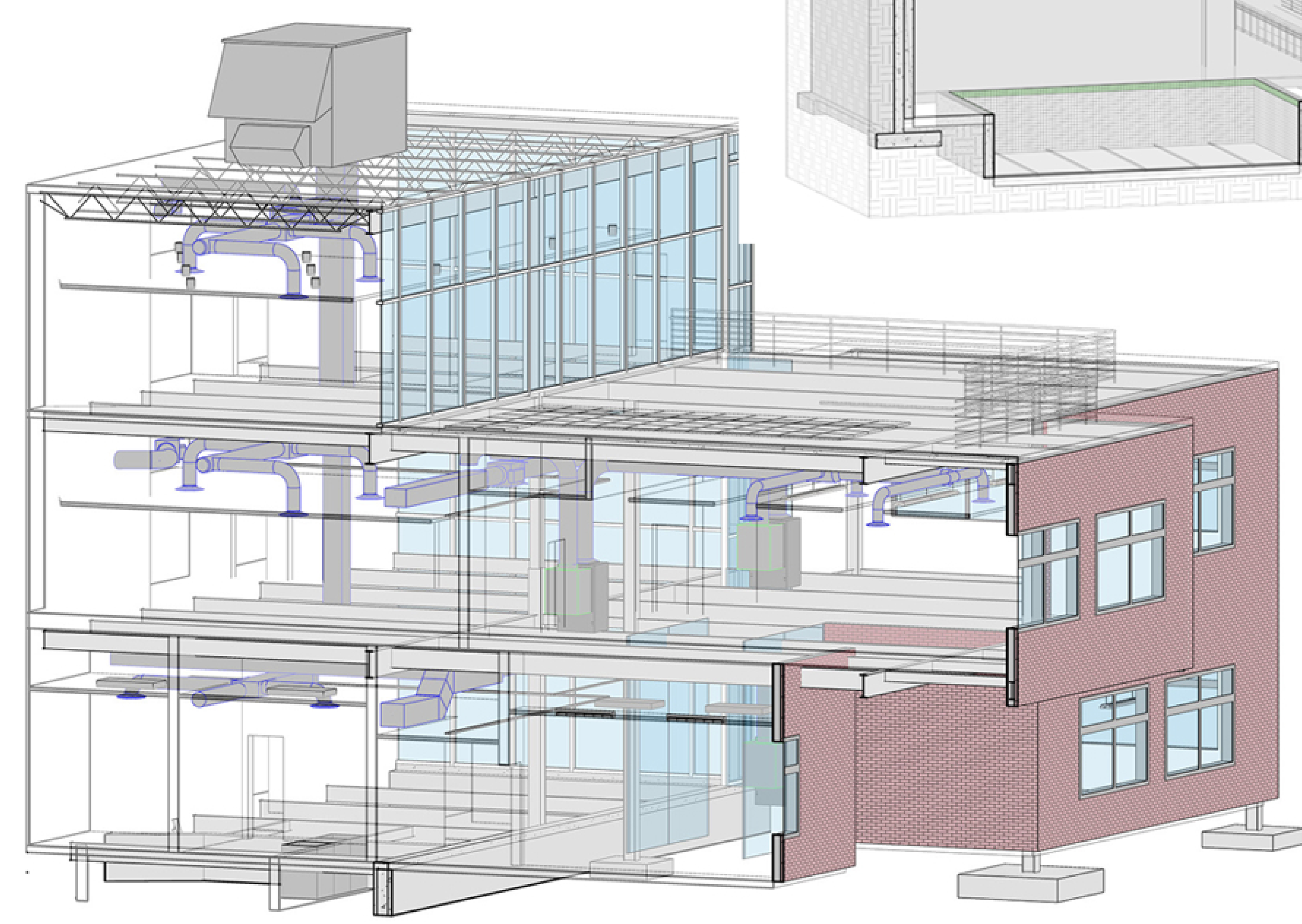


Middle Building Section w/ Basement (B)

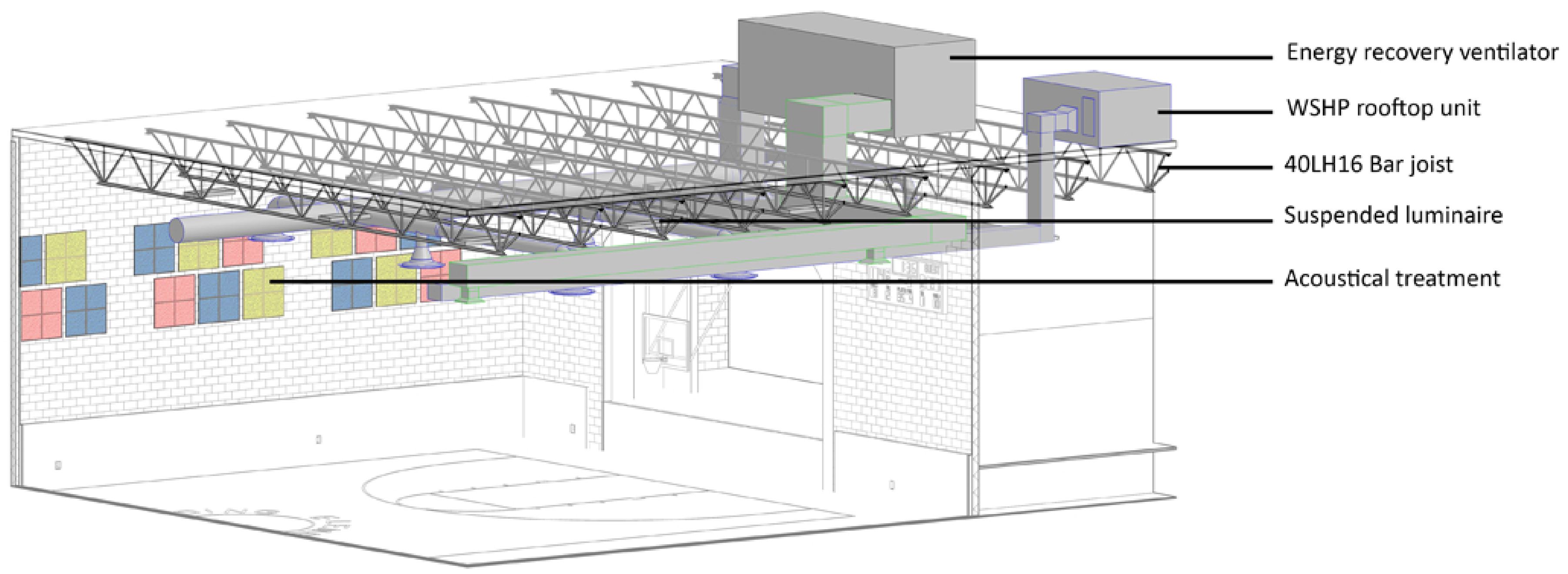




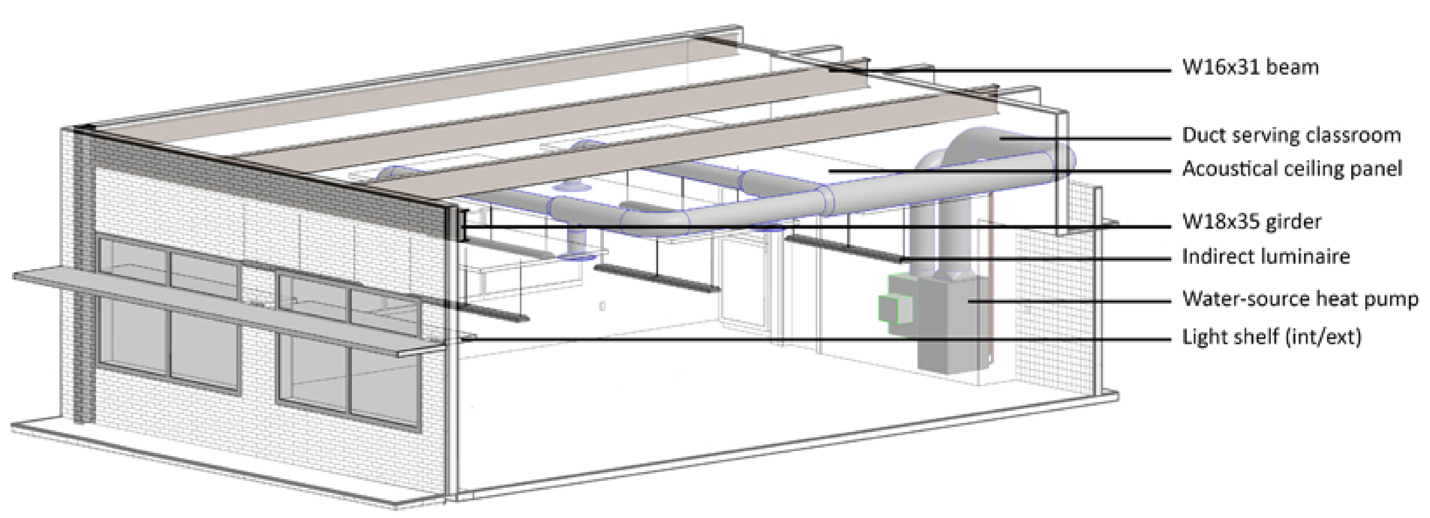
Western Building Section w/ Multipurpose Room (A)



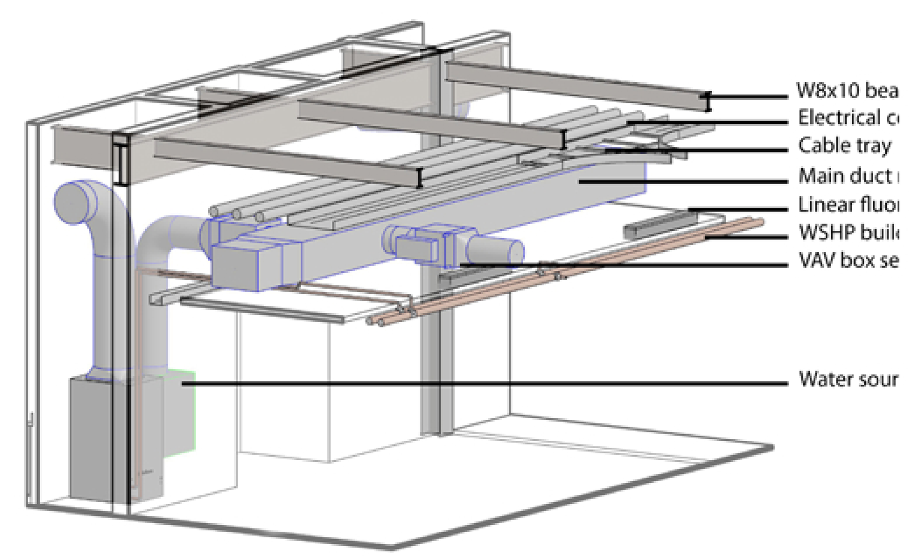
Eastern Building Section (C)



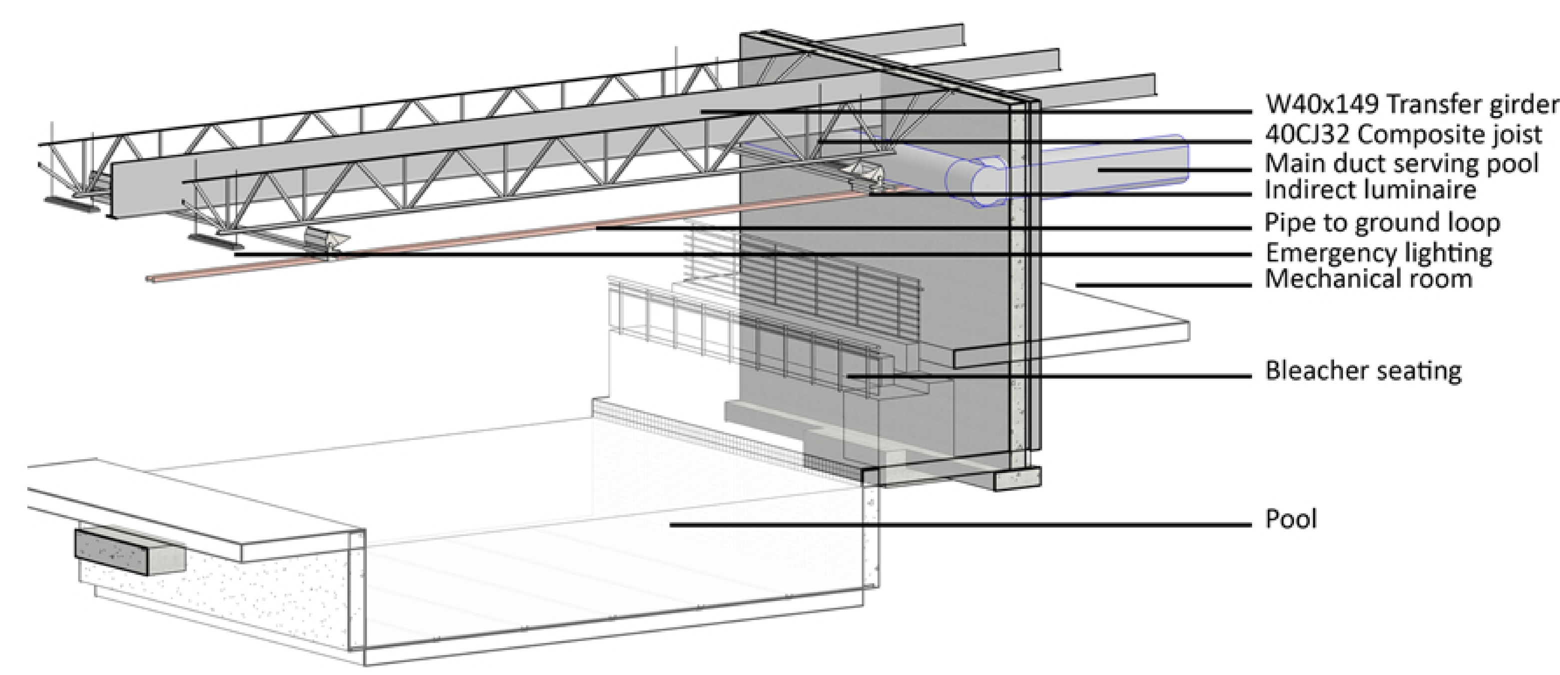
Multupurpose Room Systems Integration



Classroom Systems Integration



Hallway Systems Integration



Pool Systems Integration

Revit is an excellent tool for displaying information in three dimensions. Using a 3D model of RES, the design team was able to model all systems simultaneasously and gain valuable insight into how spaces would look. This is an important asset because it will ultimately lead to fewer clashes in the field, which will save both time and money. Also, the ease with which things can be modeled in Revit allows designers to "try out" a number of different design options in a virtual computer environment before deciding the best one to pursue.

Basic constructability items include dangerous heights in both the Multipurpose Room and Pool Area and limited space in Hallways. More detailed items include penetrations through certain walls, especially the load bearing walls of the proposed pool design. 3D models similar to these will constantly updated and sent into the field to improve speed, quality, and safety. Specific areas of the model will be detailed further when it is time for their construction in the field.

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Elem School

Integrated Sections

Project Number	1
Date	2/22/13
Drawn By	AEI 10-2013
Checked By	NA

CM-301

Scale